ENVIRONMENTAL VALUES AND BELIEFS IN UNIVERSITY STUDENTS

by

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Abstract

People's personal values and beliefs are believed to be a key factor underlying their willingness to engage in environmental conservation. Values are learned throughout the individual's life, and educational institutions are assumed to be a vital part of that socializing process. The present research explores whether different academic programs at the university-level have an influence on the values of the students in those programs. In previous research, values that are associated with environmental conservation include: environmental values, values of equality and justice, and of benevolence towards others. The values that have been linked to anti-environmental orientations are beliefs in the importance of growth and technology, valuing power and wealth, and having an utilitarian approach to nature. Using a cross-sectional quasi-experimental design, students in the 1st and 4th year of five university programs, Environmental Studies (N= 22), Biology (N= 55), Health Sciences (N = 49), Environmental Engineering (N = 37) and Commerce (N = 67), completed a questionnaire that assessed the above values and beliefs. Contrary to predictions, within the different academic programs there were no significant value differences between 1st and 4th year students. This finding suggests that students' program of study does not have a strong influence on their values. Instead it appears that students select a program of study that matches the values they hold when they enter university. This is supported by the significant differences found amongst the results of students majoring in different academic programs. In addition to completing the values measures, fourth year participants were also asked to reflect upon the education they received over the course of their undergraduate degree and to indicate the following for a subset of the values: (1) which values were fostered the most by their academic program and (2) what values they believed had strengthened or weakened as a function of their education. In terms of values fostered by their program, Biology and Environmental Studies students felt values of equality, justice, benevolence and above all, environmental protection, were fostered the most. Environmental Engineering students showed similar results but to a lesser degree, while Commerce students felt that the most fostered values were related to achievement and power. Furthermore, fourth year students believed that their education had changed their values. Students in Biology and Environmental studies believed their courses increased the extent to which they valued protecting the environment. Environmental studies students and Commerce students believed that their programs increased the importance of social power.

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Chapter One

Introduction

1.0 Introduction

In this thesis I present the results of my research on the environmental values of students majoring in different academic programs at the University of Northern British Columbia. The purpose of this study was to better understand an understudied field of research: students' environmental values and the impact that university has upon those values. The focus was placed on the impact that majoring in particular academic programs had on the environmental values of students. The study includes, along with an evaluation of a broad system of human values, an examination of students' environmental values. Also, student's beliefs in economic growth and technology were evaluated. As will be explained in further detail in the "Literature Review" (Chapter 2), the general values, environmental values, and beliefs in economic growth and technology held by people are associated with people's behaviour towards the environment.

Environmental education has become a growing topic of interest. Yet, despite many efforts to "green" the curriculum of universities and promote environmentalism in students, little evidence is available about whether these efforts are becoming successful. In the last decades, the topic of sustainability in higher education has become a growing issue. Universities started trying to improve their operations and facilities to reduce their ecological footprint, as well as the dedicate efforts to improve environmental education across the whole curriculum. The Talloires Declaration of 1990 and the Hallifax Declaration of 1991 were responses to the increase in the significance of this issue. Signatories to these declarations (UNBC became one of them in 2006) make a commitment towards sustainability and to increase the environmental literacy of all students and faculty. Nevertheless, ample criticism has been raised towards higher education for not challenging worldviews of materialism,

economic growth at all costs, and technology over behavioural and policy solutions. Cortese (2003) states that universities hardly ever ask students to challenge the following common assumptions:

- Humans are the dominant species and separate from the rest of nature;
- Resources are free and inexhaustible;
- Earth's ecosystems can assimilate all human impacts;
- Technology will solve most of society's problems;
- All human needs and wants can be met through material means;
- Individual success is independent of the health and well-being of communities, cultures, and the life support systems (Cortese, 2003).

The values of students will determine what they will strive for in life after their degree as well as what they will be willing to do to obtain what they want. As for my interest in undertaking research in this field, there were two main reasons for it. The first one has to do with my nationality and my work with different non-profit organizations in my home country. Having been born and raised in Argentina, a developing country, I became well aware of the difference in power between those with a university education and those who do not have one. About 6% of the world's population has a university degree, yet, most of the people, worldwide, who make the decisions which run our societies do possess a university education. While working for several non-profit organizations in my home country, I saw the face of poverty on a daily basis. I witnessed environmental injustice, seeing how the poorest members of society were pushed towards the most polluted, inhospitable environments, where their health and quality of life was diminished to the lowest standards. Over time I realized how these occurrences were not subject to the decision making of the underprivileged people who lived in those circumstances, but resulted because of the decisions of people with means and power. For many years I wondered what education these people had and what values were fostered in them. The second reason for my interest in the

impact that different academic programs at university have on students' environmental values was to confirm or dismiss some assumptions and hypotheses I formulated throughout the years I spent majoring in Commerce and Economics. I did part of my undergraduate studies in the United States and the rest in Argentina. In both places I found that the education I had been given fostered all of the assumptions mentioned by Cortese (2003). Also, I find that those who graduated with me in Commerce or Economics hold these assumptions in high esteem and use them to guide their day to day behaviours. Therefore, I wanted to compare the values of commerce students with those of students in different degrees, and better understand what values they hold dear and which values are fostered by the different academic programs.

To sum up the role that I think values should play in education I will quote David Orr (1991, p. 52) as he discussed the role of highly educated people in World War Two, noting that these dark characters in history were the heirs and descendants of Kant and Goethe.

> In most respects the Germans were the best educated people on Earth, but their education did not serve as an adequate barrier to barbarity. What was wrong with their education? In Wiesel's words: "It emphasized theories instead of values, concepts rather than human beings, abstraction rather than consciousness, answers instead of questions, ideology and efficiency rather than conscience"... My point is simply that education is no guarantee of decency, prudence, or wisdom. More of the same kind of education will only compound our problems.

Booth (1998, p.5) further reflects on David Orr's ideas and the role of higher education in fostering values in students, by saying:

> Now the words values and conscience might ring alarm bells, particularly for those who have had cause to criticize rational-scientific-industrial society's choices of values. Wiesel's comment is particularly relevant for resource managers, because it sums up succinctly the essential nature of the education most resource managers currently receive. Examining the curriculum and the pedagogy in today's forestry, wildlife and fisheries biology, and other natural resource management degrees one finds theories, abstract concepts, an ideology of economic efficiency, and an emphasis on answers substituting for careful thought. The consequences, for both the resources and a resource dependent society, are profound.

Therefore, through this research I will try to better understand the impact that university education and the academic program of choice have on students' environmental values. The results might help us understand if there are academic programs which foster environmental values in a positive way, and if there are programs which do not foster this values or make them weaker. The hope is that this research, through giving us a better understanding of the impacts of higher education on environmental values, will also provide some insight on how to improve the capacity to enhance environmental values at this level of education.

1.1 Purpose of the Research

The purpose of this research was to assess the environmental values, environmental concern and beliefs in economic growth and technology amongst university students majoring in different academic programs. The focus was placed on the impact that university and academic program of choice had on the aforementioned variables. To do this the difference

between the values of first year students and fourth year students was assessed. In order to explore the changes in values experienced by each person, I also asked fourth year students to report whether some value categories had become stronger, stayed the same, or become weaker since the time they entered university. Lastly, students were asked to indicate, out of a comprehensive list of 37 human values, the five values which were fostered the most by the academic program they were majoring in. Thus, a wide range of values were assessed to explore the impact that each program had on the students who major in it.

The research question which guided this research was the following:

What is the impact that university education has on the environmental values of students?

In order to answer this main question, three subquestions were asked:

1) *On average, do UNBC students show a concern about the environment?*
2) *Do students in different programs differ in their values?*
3) *Does university contribute to the differences we see in the values of students from different academic programs?*

A few hypotheses were formulated:

1) Overall, university will have a positive impact on the environmental values of students.
2) Some programs will be more positively affected than others. A positive impact is expected on the environmental values of Biology and Environmental Studies students, while an increase in Power and Achievement values (egoistic values) is expected to be found in Commerce students.

1.2 Organization of the Thesis

Chapter one has introduced the origins of this thesis, its objectives and the research questions that guided the study. In chapter two, a review of the existing literature is presented. The literature review includes the following topics:

- An overview of theories of human value systems;
- Different value theories and their impacts on environmental behaviour. This section includes post-materialistic vs. materialistic values, and ecocentric vs. utilitarian views of nature;
- Beliefs in economic growth and technological solutions, and the implications they have on environmental behaviour;
- Education and environmental values, the increased efforts to green universities, and interventions that impacted environmental values

Chapter three explains the methodology used in this research and chapter four shows the results of the thesis, chapter five discussed my results. Chapter six presents the conclusions of this thesis as well as some recommendations.

Chapter Two

Literature Review

2.0. Introduction

The environmental movement has now been amongst us for over 4 decades. Progressively during this time period, more people have become personally affected by environmental degradation or aware of and concerned about its issues. The range of problems related to the environmental degradation of concern to society over the last few decades has become broader. While in the 1970s the major environmental problems which received attention were usually air pollution, water pollution, loss of aesthetic values, and energy conservation, in recent decades, environmental problems have evolved beyond the local, becoming more geographically dispersed, less directly observable, and more ambiguous in origin (Dunlap et al., 2000, p. 426). Humans, as a species, are becoming more capable of understanding the implications of our behaviours on the wellbeing of the environments that sustain us. For this reason, aligning our behaviours within the capacity of the earth to sustain us and other species is crucial for us and future generations to enjoy life as we currently know it on this planet.

Historically, decisions concerning environmental protection tended to be perceived as a trade-off against economic development (Dunlap & Saad, 2001) or a conflict between trees and jobs (Schultz and Zelezny, 2003). At the individual level, environmental behaviour can also be perceived as a conflict between convenience and sacrifice. Regardless of this, it is important to remember that an individual's behavioural choices concerning the environment are based on that individual's values (Schultz and Zelezny, 2003). Values convey what is important to us in our lives and are motivational constructs that represent our goals across time and that guide our behaviours (Bardi & Schwartz, 2003). According to Rokeach (1973), people behave according to their values because they need consistency between their

behaviors and their values. Therefore, the perception of trade-offs that can become barriers to our environmental behaviours will be emphasized or minimized depending on what we deem important in our lives. Possessing strong environmental values does not necessarily mean that one will behave in an environmentally friendly way every time, there are many other factors that guide our behaviours (Bardi & Schwartz, 2003). Nevertheless, individual values is one of the factors that guide environmental behaviour (Kollmus & Agyeman, 2002) and many authors agree that it is a factor of significant importance (e.g.; Stern & Dietz, 1994; Karp, 1996; Schultz & Zelezny, 1999; Bardi & Schwartz, 2003).

The focus of this research lies in better understanding the capacity of university education to improve the environmental values of its students. The role of universities concerning the topic of sustainability was well defined in the 1990 gathering of twenty two university leaders, which resulted in the creation of the Talloires Declaration, "Universities educate most of the people who develop and manage society's institutions. For this reason, universities bear profound responsibilities to increase the awareness, knowledge, technologies, and tools to create an environmentally sustainable future" (Report and Declaration of The Presidents Conference, 1990, as cited in Clugston & Calder, 1999, p2). The Talloires Declaration was the first of many declarations which emphasized the role that higher education needed to play in creating a more sustainable future. Measuring the environmental values of students and assessing whether they change or not throughout the time they spend majoring at an academic program at university is a way of testing the effectiveness of the efforts undertaken to green higher education institutions. Also, it helps assess whether higher education is positively contributing in making its graduates better environmental citizens.

2.1. Values and Pro-Social Environmental Behavior

Prosocial behavior is a concept that refers to the voluntary actions that are intended to help or benefit another individual or group of individuals (Eisenberg and Mussen, 1989). In this sense, environmental behaviour is a form of prosocial behaviour which extends to non-human species and to the environment (rather than only to other individual or group of individuals). This research focuses on the effect of higher education on environmental values. Values are of significant importance to environmental behaviour and a broad body of literature exists that suggests this (Schultz and Zelezny, 2003). Several models exist that show the relations of different values with environmental behaviour. In order to demonstrate the importance of values in shaping environmental behaviour, several models and studies will be presented which suggest this relation.

One line of research focuses on the cultural shift from materialistic to postmaterialistic values in western society and the impact these values had on environmental concern, awareness and behaviour. "There has been a gradual overall rise in the ratio of Postmaterialists to Materialists amongst western publics" (Inglehart, 1990, p.67). The rise of postmaterialistic values, which started in the 1960s, brought new topics to the political agenda which were outside of the traditional economic discussions, amongst which were considerations concerning the health of natural environments (Inglehart, 1990). Inglehart argued that the rise of a new socioeconomic class with postmaterialistic values generated concern in western society regarding environmental issues that transcended local environmental problems (Goksen et al., 2002). Other studies tested the impact of the geographical proximity of environmental problems on environmental concern and willingness to pay for environmental improvement based on different levels of materialistic/postmaterialistic values. These studies

found that people with materialistic values exhibited more concern for local environmental problems which had a negative effect over the individual, while Postmaterialists demonstrated a higher willingness to pay for improvements in both local and global environmental problems (Goksen et al., 2002). This shows a stronger willingness to take action against environmental degradation by Postmaterialists than by materialists. Grob (1995) found that out of four factors (personal philosophical values, environmental knowledge and awareness, emotions and perceived control) it was the endorsement of postmaterialistic philosophical values which had the biggest impact on environmental behaviour, while suggesting that materialistic values had a negative effect on this type of behaviour.

Other studies focused on discussions of the impacts of utilitarian (anthropocentric) and ecocentric values on pro-environmental behaviour (Zinn and Pierce, 2002; Thompson and Barton, 1994; Papadakis, 2000). Utilitarian concern about the environment (Anthropocentrism) focuses on the preservation of the environment because of its good for humankind (Papadakis, 2000). On the other hand, ecocentric values portray a concern for the environment based on nature's own intrinsic value rather than because of its use for humankind (Thomson and Barton, 1994). Studies have shown that ecocentric values have a positive relation to environmental attitudes and behaviours and that utilitarian values have a negative relation to both environmental attitudes and behaviour. Ecocentrism related positively to political predisposition to protect the environment while utilitarian values relate negatively (Papadakis, 2000). People with utilitarian values were more willing to kill dangerous wild species than people with ecocentric values (Zinn and Pierce, 2002). Also, people who saw nature as valuable in its own right (ecocentrism) expressed less overall

environmental apathy, were more likely to conserve, and joined more environmental organizations than people portraying anthropocentric values (Thompson and Barton, 1994).

2.2. Schwartz's model of human values and environmental behaviour

There is a line of studies that link specific human values to environmental attitudes and behaviour which is of particular interest for my research. These are the studies which utilize Schwartz's values model. Schwartz (1992;1994) developed a model of human values which is at the same time comprehensive and practical. According to this author "a value is a (1) belief (2) pertaining to desirable end states or modes of conduct, that (3) transcends specific situations, (4) guides selection or evaluation of behavior, people, and events, and (5) is ordered by importance relative to other values to form a system of value priorities" (Schwatz, 1994, pp. 20). Values represent, in the form of conscious goals, responses to three universal requirements with which all individuals and societies must cope: needs of individuals as biological organisms, the requisites of coordinated social interaction, and the requirements for the smooth functioning and survival of groups (Schwartz, 1994, p.21).

One of the interesting distinctions of Schwartz's (1992; 1994) model of human values is the arrangement of values along two dimensions. The first dimension groups values along a dimension of self-enhancement to self transcendence. Self-enhancement reflects the pursuit and enhancement of self-interest, while Self-transcendence reflects concern for the welfare of others, familiar or unknown, and of nature (Karp, 1996). The second dimension groups values on a continuum ranging from openness to change to conservative and traditional values. Openness to change reflects independence, enjoyment of life, excitement, novelty,

etc, while Tradition reflects values which want to preserve the status quo and the security provided by a lack of change in institutions, relationships and traditions (Karp, 1996).

Schwartz suggests that most values portrayed by members of different cultures can be classified into one of ten motivational types of values; these motivational categories are organized based on whether a group of values are found in the Self-enhancement to Self-transcendence or in the Tradition to Openness to change side of the values spectrum. In this theoretical framework, values appear in a circular continuum, with some values competing with each other and appearing in the opposite direction in the circle, and other values sharing similar motivations appearing side by side. Figure 1 refers to this structure of values, where Self-enhancement and Self-transcendence, and Openess to change and Tradition, appear on opposite sides of the circle.

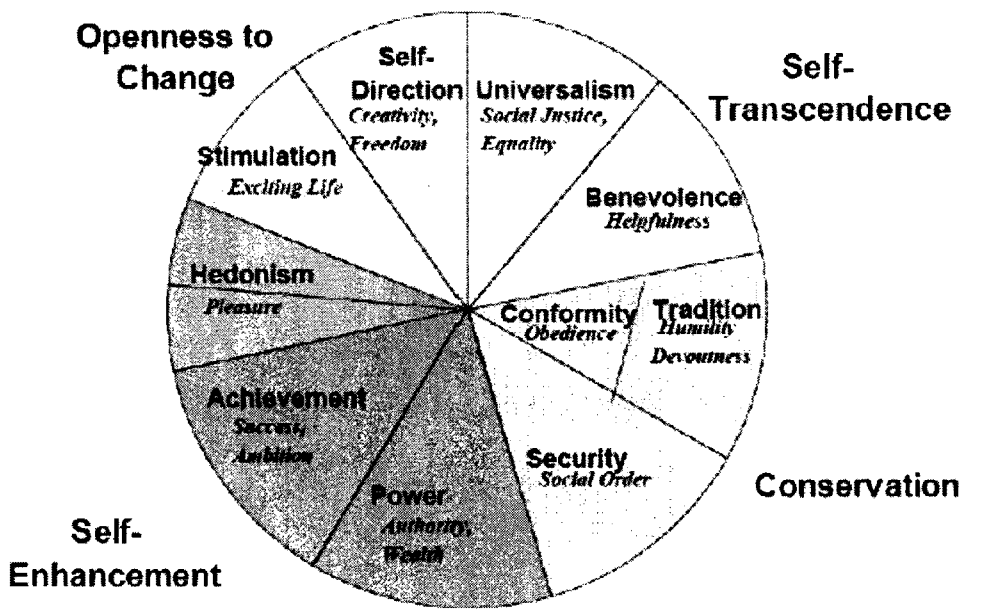


Figure 2.1. Theoretical model of relations among motivational types of values, higher order value types, and bipolar value dimensions (Schwartz, 1994)

Table 2.1 describes each motivational value category in detail, stating the desired end goal of each value category, while Table 2.2 shows which values fall under each category.

Table 2.1.

Schwartz's (1994) value categories and its descriptions

VALUE CATEGORY	DESCRIPTION
Power	Social status and prestige, control or dominance over people and resources
Achievement	Personal success through demonstrating competence according to social standards
Hedonism	Pleasure and sensuous gratification
Stimulation	Excitement, novelty, and challenge in life
Self-Direction	Independent thought and action – choosing, creating, exploring
Universalism	Understanding, appreciation, tolerance, and protection for the welfare of other people and nature
Benevolence	Preservation and enhancement of the welfare of people with whom one is in frequent personal contact
Tradition	Respect, commitment, and acceptance of the customs and ideas that traditional culture or religion provide
Conformity	Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms
Security	Safety, harmony, and stability of society, of relationships, and of self

Table 2.2.

Value Categories and the Values they Contain.

VALUE CATEGORY	Value Dimension	VALUES INCLUDED
Power	Self-Enhancement	Social power, authority, wealth, preserving my public image, social recognition
Achievement	Self-Enhancement	Successful, capable, ambitious, influential, intelligent, self-respect
Hedonism	Openess to Change	Pleasure, enjoyment of life
Stimulation	Openess to Change	Daring, a varied life, an

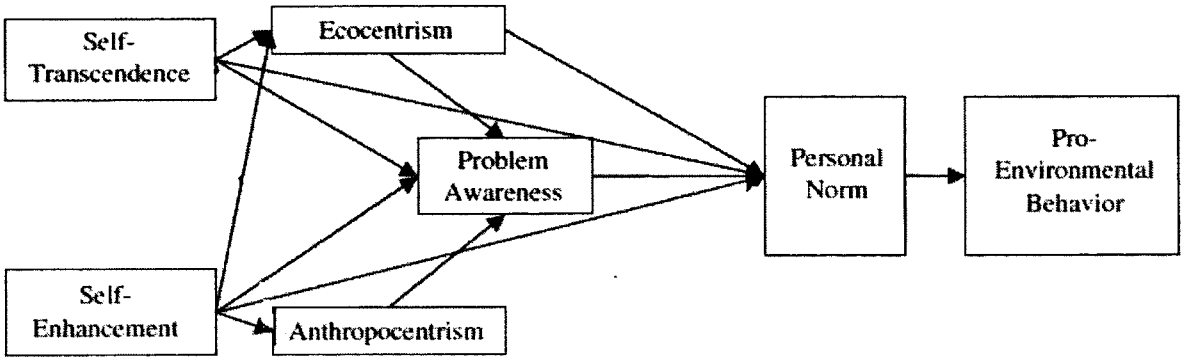
		exciting life
Self-direction	Openess to Change	Creativity, curious, freedom, choosing own goals, independent
Universalism	Self-Transcendence	Protecting the environment, a world of beauty, unity with nature, broad-minded, social justice, wisdom, equality, a world at peace, inner harmony
Benevolence	Self-Transcendence	Helpful, honest, forgiving, loyal, responsible, true friendship, a spiritual life, mature love, meaning in life
Tradition	Conservation (Tradition)	Devout, accepting portion in life, humble, moderate, respect for tradition, detachment
Conformity	Conservation (Tradition)	Politeness, honouring parents and elders, obedient, self-discipline
Security	Conservation (Tradition)	Clean, national security, social order, family security, reciprocation of favors, healthy, sense of belonging

This model has been frequently used in studies which were looking for relations between particular values and environmental attitudes and behaviour (Grunert and Juhl, 1995; Karp, 1996; Schultz and Zelezny, 1999; Stern et al., 1999; Nordlung and Garvill, 2002). The advantage of Schwartz's model is that it creates a very detailed depiction of the values of people beyond the materialistic/postmaterialistic or particular perceptions of the environment like ecocentrism/anthropocentrism which were described in the previous section. This allows for a better comprehension of the values of people who show a positive tendency towards pro-environmental behaviour.

The norm activation theory (Schwartz, 1977) is one of the models of decision making which links values and behaviours. This model though, focuses only on values of altruism, therefore it is a model of behaviour in moral situations that can apply to decisions related to environmental action. This model has three components: a set of altruistic values held by an individual (e.g. protect the environment), beliefs that things important to those values are under threat, and beliefs that actions initiated by the individual can help alleviate the threat and restore the values (Schwartz, 1977).

Therefore if a person believes in the protection of the environment as a strong value and sees that a forest which is dear to him is under threat of being cut down, that person will act to save it if he believes that his action can accomplish something which will diminish the negative impact to that forest. This model can also be useful in understanding more basic and daily behaviours such as recycling or taking the bus. If an individual sees the connection between an environment he cares about and waste, he will choose to recycle if he believes that this action will make a difference and if the barriers to that action are not so high that the individual finds that the action has an even bigger negative effect on a different value, such as convenience or wealth.

Other studies based themselves on the norm activation theory and focused on the mediating effect that personal norms have between general values (as described by Schwartz, 1992) and environmental behaviour in particular, rather than on a generalized model of pro-social behaviour (Stern et al., 1999; Nordlund & Garvill, 2002). In the context of a model meant to explain environmental behaviour, the concept of personal norm was described by Nordlund and Garvill (2002) as a feeling of moral obligation to protect the environment. Both groups of researchers (Stern et al and Nordlund & Garvill) generated a hierarchical model in which



factors on a higher level would be expected to directly influence factors on the next lower level and on factors further down the system (Nordlund & Garvill, 2002).

Figure 1.2. Model of the Influence From Value, Problem Awareness, and Personal Norm on Proenvironmental Behavior (Nordlund & Garvill, 2002)

The model of Nordlun & Garvill starts with general values (utilizing the value directions of Self-enhancement and Self-transcendence proposed by Schwartz). The next level is made of environmental values (Ecocentrism and Anthropocentrism), which is followed by the factor 'problem awareness[1]', and finally by the personal norm, which is the factor that will guide the environmental behaviour.

These authors tested this model and found that general values influence environmental values (self-enhancement influences positively on anthropocentrism while self-transcendence influences ecocentrism). Self-transcendence and Ecocentrism had a positive influence on problem awareness, while Self-enhancement and Anthropocentrism had a negative influence on problem awareness. Self-transcendence, Ecocentrism and problem awareness all had a

[1] Problem awareness functions similarly to the concept described by Schwartz (1977) in the norm activation theory as beliefs that something or someone valuable to the individual is at risk or threatened, in this case the environment as a whole or some component of the environment (e.g. a location or an animal species).

positive effect on the personal norm, while Self-enhancement had a negative effect and Anthropocentrism had no significant effect on this variable. Finally, it was the personal norm the factor that had a large influence over pro-environmental behaviour.

Other authors explored the role of general values on environmental attitudes. Schultz and Zelezny (1999) found that Universalism values (one of the categories under the Self-Transcendence value dimensions proposed by Schwartz, 1992) were predictive of Ecocentrism values and of pro-environmental attitudes, while Power (a Self-enhancement value category) and Tradition (a Conservation value category) were negatively related to Ecocentrism and environmental attitudes.

One more set of studies is of importance in order to better understand the relation of general values, as described by Schwartz and environmental behaviour. These studies make a direct connection between values and environmental behaviour, without the need for mediating effects of personal norms as in the research of Stern (1999) and Nordlund & Garvill (2002). Karp (1996) analyzed the role of personal values in influencing pro-environmental behavior. He found that out of the four general value dimensions described by Schwartz (Self-transcendence, Self-enhancement, Conservation, and Openness to change) the values of Self-transcendence (Universalism and Benevolence) and Openess to change (Hedonism, Self-direction, Stimulation) had a positive influence on environmental behavior. On the other hand, the values of Conservation (Tradition, Conformity, Security) and Self-enhancement (Power and Achievement) had a negative relation to environmental behavior. The values of Universalism, Benevolence and Self-direction were also strongly supported by people who chose to purchase organic foods (Grunert & Juhl, 1995).

All these studies that link general values as discussed by Schwartz (1992) came to the same conclusion, that the Self-transcendence value dimension shows a positive relation to environmental attitudes, ecocentrism, personal norms towards environmental protection, and environmental behaviour. On the other hand, Self-enhancement values (Power and Achievement) show a negative relation to environmental attitudes, ecocentrism, personal norms, and pro-environmental behaviour. These studies show the importance of understanding human values as a first step to understanding pro-environmental behaviour. Because of this strong positive relation found between pro-environmental behaviour and Self-transcendence values and the negative one found with Self-enhancement values, it is important to see what values are fostered in university and what effect university is having over the general values of students (Self-transcendence, Self-enhancement, Openness to change, and Conservation) and environmental values (Ecocentrism and Anthropocentrism).

One last worldview and its relation to environmental behaviour is going to be presented. This worldview is going to be based on whether or not people see benefits in economic growth and if they have faith in technological solutions to environmental degradation. The next section will briefly analyze the literature that describes the relationship between these worldviews and environmental attitudes and behaviours.

2.3. Beliefs in Economic Growth and Technology and its Impact on Environmental Behavior.

Many authors have written about the role of economic growth in increasing and decreasing our environmental problems. An important line of studies emerged when the Environmental

Kuznets Curve was introduced in the early 1990s by Grossman and Krueger (1991). This theory (the Environmental Kuznets Curve, or EKC) suggests an inverted U shape for environmental pollution as countries increase their GDP per capita. At the first stages of development and economic growth, pollution and degradation increase, but at a certain point society hits a level of income per capita where the trend reverses, meaning that at high levels of income economic growth leads to environmental improvement (Stern, 2004). This theory is supported by many authors (e.g. Grossman & Krueger, 1991; World Commission on Environment and Development, 1987; Beckerman, 1992), and its validity is questioned by others (e.g. Stern, 2004; Copeland & Taylor, 2004). Other authors argue that the Kuznets Curve theory has only been valid for pollutants involving short term costs (sulphur, particulates, and fecal coliforms) and not pollutants involving more dispersed and long-term costs such as CO_2 (Arrow et al., 1995). Also, this idea that economic growth eventually improves environmental quality is not likely to hold when environmental and resource stocks are considered (Arrow et al. 1995). There are limits to the carrying capacity of the planet, and economic growth is not the issue, but which type of growth, and which inputs and which outputs. Arrow et al. (1995) say:

> "Economic growth is not a panacea for environmental quality; indeed, it is not even the main issue. What matters is the content of growth – the composition inputs (including environmental resources) and outputs (including waste products). This content is determined by, among other things, the economic institutions within which human activities are conducted." (Arrow et al., 1995, p. 520)

Bartlett (1998) takes this argument further and states that economic growth, especially materially and resource dependent economic growth, is unfeasible in the long term on a

finite planet. Nevertheless, it is possible that improvements in the management of resource systems, accompanied by resource-conserving structural changes in the eonomy, would enable economic and population growth to take place despite the finiteness of the environmental resource base, at least for some period of time (Arrow et al., 1995). Eternal economic growth is unlikely, yet, this paradigm is hardly ever questioned by institutions of higher learning (Cortese, 2003; Bartlett, 1998).

But the argument here is really not whether economic growth is good or bad for the environment in the long run. This research is based on the values and worldviews of students and how university affects them. Therefore, at this point I am interested in showing the impact that beliefs in economic growth and technology have over environmental behaviour in order to emphasize the importance of studying these beliefs in university students. Cortese (2003) argues that economic growth and technological advancement are two paradigms which are strongly supported in our society, and institutions of higher learning are strongly responsible for the proliferation of these ideals. There is a positive correlation between believing that technology will solve all our problems and a lack of environmental behavior (Kollmus & Agyeman, 2002). Several studies suggested that people with high levels of belief in technological solutions to environmental degradation are less willing to make personal sacrifices for the environment. Behaviors such as driving less or consuming less products are less frequent in people with strong beliefs in technology (Gigliotti, 1992; Grob, 1995). These studies suggest that the belief in technology takes away the sense of urgency to behave environmentally. The assumption is that no matter what happens, technology will come to the rescue, therefore there is no real need to behave environmentally. Even more, people who perceive the benefits of economic growth and

believe in technological solutions are less willing to make sacrifices destined towards environmental protection (Gigliotti, 1990)

The past sections have discussed the relationship between general values, environmental values (Ecocentrism, Anthropocentrism), and several different worldviews (Growth & Technology, Materialism/Postmaterialism) with environmental behaviour. These studies suggest an important relation between these variables and environmental behaviour. The next section will focus on understanding the role of education in forming pro and anti-environmental values, especially at the university level.

2.4. How are pro-environmental values formed?

Environmental values, as was previously mentioned, are a set of values which can be generated in individuals due to different reasons. These particular set of values are unique in terms of their motives. One of these motivators is altruism, which can come in two forms. The first is ecocentrism, which is the concern for nature due to the recognition of nature's own intrinsic value. The second one is homocentric concern, where the individual is concerned about the consequences of environmental degradation because of its impact on other people whom the individual does not know, or concern for the wellbeing of future generations. The last environmental value is recognized as egoistic, were the individual is concerned only about environmental degradation when the effects of it have a direct impact on himself or people close to him. This last one is related to a utilitarian view of nature, and as previously described, people with strong egoistic environmental values but with a lack of

ecocentric environmental values tend to behave poorly environmentally (Thompson & Barton, 1994; Papadakis, 2000; Zinn & Pierce, 2002).

The literature that will be presented here refers mostly to altruistic environmental values. The reason for this is that these are the type of environmental values that need to be encouraged, the ones that transcend local issues and that give value to nature, global environmental issues, and the ascription of importance to issues that transcend this generation.

In the 1980s, a new line of research in environmental education focused on the significant life experiences leading to environmentalism. Tanner (1980), the first researcher working in this field, questioned environmental education, saying that its ultimate purpose should be the generation of individuals who furthered the cause of maintaining a varied, beautiful, and resource-rich planet for future generations. In order to accomplish this he suggested that environmental education researchers should look at those who were already working towards those ends and try to understand which kind of learning experiences produced such people. 'One way to explore the determining factors that shape environmental values is to study the life experiences that have shaped the beliefs and values of active environmentalists' (Kollmus & Agyeman, 2002, p.251). Therefore, according to Kollmus & Agyeman, the research done in the area of experiences that lead to environmentalism could indicate which experiences build environmental values. Studies showed that during childhood, the most meaningful events leading to environmentalism were experiences of natural areas and family. During the adolescence and early adulthood years, the most significant events were education and friends, while studies showed that at adulthood the biggest influence in generating environmentalism were pro-environmental organizations (Chawla, 1998). The importance of values education in order to generate pro-environmental behavior is also supported by a study

by Shean & Shei (1995). They studied the knowledge and values of university students and came to the conclusion that factual knowledge of environmental problems does not necessarily translate into verbal commitment, action, or affective involvement. The environmentally active students placed significantly more importance on the values of responsibility and concern for the welfare of others, and they de-emphasized the importance of personal affluence and political accomplishments (Shean & Shei, 1995). In a similar way to Tanner and Chawla, Shean & Shei (1995) identified environmentally active people (in this case students) and tried to assess which factors helped them attain their value system. These studies give a hint for the importance of education in the adolescence and early adulthood years in generating pro-environmental values. The next section will look deeper at values and education.

2.5. Education and values

Studies have given credit to education (especially amongst university students), amongst other variables, for the generation of environmental commitment and values in people (Chawla, 1998). "Environmental education is directly and overtly concerned with influencing (some suggest fundamentally changing) learners' attitudes and behaviors and it is widely held that values education is central to this process" (Scott & Oulton, 1998). Nevertheless, there have been broad discussions over the last twenty years about whether a value based or a knowledge based education is more efficient in influencing actual pro-environmental behavioral change (Ballantyne & Packer, 1996). Studies have shown that the most effective educational interventions focused both on knowledge and values (Hungerford and Volk, 1990; Ballentyne & Packer, 1996). This fact does not undermine the power of values in

education to improve pro-environmental behavior, it shows the complexity of the behavioral issue as well as the difficult task education needs to face as an instrument of pro-environmental change.

2.5.1. University curriculum and environmental values

Even though the environmental movement has been around since the 1960s, serious discussions about the role of higher education in sustainability did not happen until the early 1990s. The Talloires declaration of 1990 was one of the first attempts to define what a sustainable university would look like (Clugston and Calder, 1990). This declaration advocates for higher levels of environmental literacy in all academic programs and for the universities to set an example in terms of their own operations and infrastructure as well as by encouraging programs concerning resource conservation, recycling, and waste reduction (ULSF, 1990). The Talloires declaration was followed by other similar initiatives such as the Halifax declaration of 1991 and the 1995 Campus Earth Summit at Yale University, where the 'Blueprint for a Green Campus' was produced. Even Agenda 21, the report of the United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, Brazil, June 1992, included a chapter on education for sustainable development (Haigh, 2005). Overall, these initiatives all focus on similar themes: sustainable physical operations, sustainable academic research, environmental literacy, ethical and moral responsibility, cooperation amongst universities and countries, the development of interdisciplinary curriculum, and partnerships with government, non-governmental organizations and industry (Wright, 2002).

Regardless of the increased concern for the environment, sustainability, and sustainable

development, significant large scale changes in curriculum across programs at the university level were not yet perceived (Haigh, 2005). Several authors and studies have pointed out the difficulties and challenges that universities face in efficiently greening curriculums across all disciplines as well as imparting the knowledge, skills and values to improve the environmental behavior of their students. Cortese (2003, p16-17) stresses this argument through the following points:

- It is the people coming out of the world's best colleges and universities that are leading us down the current unhealthy, inequitable, and unsustainable path (Cortese, 2003).
- Higher education stresses individual learning and competition, resulting in professionals who are ill prepared for cooperative efforts.
- Designing a sustainable human future requires a paradigm shift toward a systemic perspective emphasizing collaboration and cooperation.

Cortese (2003, p17) also suggests that significant changes in curriculum have not been implemented yet, and states that universities do not ask students to challenge the following assumptions:

- Humans are the dominant species and separate from the rest of nature.
- Resources are free and inexhaustible.
- Earth's ecosystems can assimilate all human impacts.
- Technology will solve most of society's problems.
- All human needs and wants can be met through material means.
- Individual success is independent of the health and well-being of communities, cultures, and the life support systems.

These statements suggest that there is a crisis of values in higher education that works as a barrier to successfully accomplishing a transformation towards environmental education. David Orr (1991) passionately argued the role of lack of values in higher education, stating that higher education emphasized theories, concepts, abstraction and answers, rather than

values, human beings, consciousness and questions. Orr (1991) also stated that the ecological crisis will not be solved by more education, saying that more of the same education will only compound our problems. He states that one of the biggest myths supported by education is the belief that through technology we can shape the world to fit our endless needs rather than to reshape our behaviors to fit the needs of a finite planet. Therefore, Orr believes that is not more education that will save us from an ecological catastrophy, but rather a special type of education which will challenge the assumptions of eternal economic growth, a predominance of technocratic solutions to our problems, and the beliefs that we can reshape the planet to fit our endless material desires. Other authors argue that education is failing in that it promotes technology as savior to all our problems, it equates growth with development and abundance with well being (Viederman, 2001; Bowers, 2001). One of the first problems universities face over greening the curriculum is that there has not been a general agreement on what 'greening the curriculum', 'sustainability education', or 'environmental education' are at the university level (McKeown & Hopkins, 2003).

Studies suggests that the ability of higher education institutions to transform themselves to address the 'education for sustainable development' agenda by curriculum greening is limited by their internal structures, especially the way they fragment knowledge with disciplinary barriers, and an ethos that seeks to divide the learner from reality through the objectification and externalization of the subjects of study (Haigh, 2005, p.44). One of the biggest issues that needs to be addressed in order to improve environmental education is the implementation of a full-scale curriculum greening, by which the ideas of environmentalism, sustainability, and sustainable development are integrated in all programs and not only those with an environmental focus (Clugston & Calder, 1999; Cortese, 2003; Wright, 2002; Haigh, 2005).

Very few examples can be found in the literature of universities that have successfully incorporated environmental education in all the academic programs that they offer. Even if many universities reformed their infrastructure and reduced the ecological footprint of their operations, higher learning institutions have not been able to achieve a full-scale greening of their curriculums (Haigh, 2005). The challenges to achieving a full-scale curriculum greening have been discussed for the past twenty years, yet, the literature does not seem to suggest that universities have accomplished a pro-environmental and pro-sustainability transformation in the curriculum across all disciplines. Even if the problem has been identified, the right questions have been asked, and more effort is being placed into large-scale curriculum greening every year, there is still work that needs to be done before this transformation is complete.

Nevertheless, there have been studies that made a direct connection between different forms of environmental education and the environmental values and attitudes of students. There is still little evidence of the large scale impact of higher education on the environmental values of students in different academic programs over the four years they spend at university.

McMillan, Wright & Beazley (2004) evaluated the impact of an introductory university-level environmental studies class on the environmental values of students. The participating students were enrolled in a wide variety of degrees, having different educational backgrounds and aspirations. Three sets of interviews were done. The first one focused on students' ideas about environmental problems and solutions, environmental values, and from where their values may have come. The second interview discussed the students' experiences throughout the course, their thoughts on the material they were learning and the format of the class. The third interview reflected upon the meaning of the experience and how it affected the

participating students. In other words, the students had to reflect on the impact of the class and how they felt about the experience. In all three interviews a special focus was placed on their environmental values and the impact the class had on those values. The results of this study showed that after the course the students had become more pro-environmental, they had become less homocentric and more ecocentric. Therefore, there was a recognizable increase in environmental values due to participation in the environmental studies class.

Other studies focused on investigating if there were any evidence of differences in values between students enrolled in different degrees at the university level. Wysor (1983) compared the environmental perceptions and attitudes of American environmental studies students with those of business students. The results indicated that environmental studies students scored significantly higher on an environmental attitudes questionnaire. Throughout this study, environmental studies students also demonstrated their environmental concern through the use of personal constructs related to environmental issues and involvement in a number of proenvironmental activities. Synodinos (1990) found that the environmental values of marketing and business students were weaker than they had been in the past and that the business curricula had neglected environmental values.

Hodkinson & Innes (2001) predicted that students studying disciplines traditionally associated with economic rationalism (commerce and business studies) and with social and political conservatism (i.e., law) would be less pro-environmental than students in disciplines conventionally considered liberal. The authors tested their hypothesis using a sample of 399 1st-year students at an Australian university. To do this they utilized two scales, the New Environmental Paradigm scale (Dunlap & Van Liere, 1978) and the Environmental Attitudes Scale (Forgas & Jolliffe, 1994). The findings supported their hypothesis that environmental

and ecological beliefs vary in relation to the discipline studied. While sociology, biology, and environmental studies students demonstrated stronger positive beliefs and attitudes toward the environment, students in law, commerce and computer studies reported weaker environmental values. These results were similar to those presented by Wysor (1983).

The literature presents studies which studied differences in the environmental values between students in different academic programs and changes in values because of the participation in an environmental studies course. Yet, there is a gap to be filled in terms of understanding the effect that university has on the environmental values of students who completed four years of higher education in different academic programs.

2.6. Chapter Conclusion

General human values have an impact on environmental values, and both general human values and environmental values have an impact on environmental behavior. Therefore, the literature suggests that understanding values is one of the first steps in understanding human behavior. Our values, combined with knowledge about the issues give individuals the motivation and understanding of the actions necessary to overcome the barriers to pro-environmental behavior that we face every day.

The environmental movement has been working for forty years to raise awareness of the environmental challenges we face and to promote action to restore and prevent further damage to the environment. Universities have been discussing environmental education and education for sustainability for the last thirty years, yet there is no consensus about what an

efficient environmental curriculum at the university would look like, and even less, how to overcome the barriers to implementing such a curriculum. Regardless of many failed efforts, there is evidence of educational interventions at the university level which increased students environmental values, even though the large scale effect on the environmental values of university graduates by the higher learning institutions in which they studied is poorly understood.

The lack of understanding of the effect of university education on the environmental values of students is evident in the literature. Therefore, this study will focus on trying to gain a better understanding of this phenomenon in a diverse group of academic programs, some which have an environmental focus, such as Environmental Studies and Environmental Engineering, another with a focus on understanding nature, like Biology, and other academic programs that do not have a direct link to either nature or environmental issues, like Health Sciences and Commerce. The study of the effects of university education on the environmental values of students in the aforementioned programs will attempt to fill this gap in the literature.

Chapter Three

Methods

3.0. Introduction

This study sets out to answer the question of what is the impact (if any) of university education on students' environmental values. As explained in the literature review, the "environmental values" will be assessed as a series of variables including values, concern for nature, and beliefs in worldviews such as the capacity of markets and technology to deal with the environmental crisis the world currently faces. These variables were chosen as they demonstrated a direct relation to environmental behavior in the existing literature.

Three different methods were used to assess the role of university education on environmental values. To accomplish this, surveys were distributed amongst students majoring in Environmental Studies, Biology, Environmental Engineering, Commerce and Health Sciences. The first method measured and compared the results obtained from the first and fourth year samples of students majoring in each of the aforementioned academic programs. Statistical tests were made to find whether statistically significant differences existed between first and fourth year samples within each academic program. This helped to determine if the fourth year students showed higher, lower or the same values as first year students. The second method asked fourth year students to reflect upon their values and state if they believe that these values had become stronger, stayed the same, or become weaker in the four years they spent at university. The values which were assessed in this way were Universalism and Power. These two values were chosen as being the ones which had the strongest relation to environmental behavior (positive for Universalism and negative for Power) in the studies presented in the literature review. The third method asked fourth year students to state the five values (out of a shortened version of the Schwartz' (1992) value instrument) that they believed were fostered the most by their academic program of studies.

These methods were developed with the intention of having a broad set of data from which to better understand the effect of university education on the values of students. This chapter will explain in further detail the methods utilized in order to gather the data and analyze it.

3.1. Participants

Participants in the study were undergraduate students at the University of Northern British Columbia (UNBC), Canada. UNBC is located in Prince George, a city with a population of approximately 80,000. While located in the geographical center of the province, Prince George is considered a northern city. Seventy percent of UNBC students come from northern communities, so a large proportion of students are categorized as having a rural upbringing. Another important characteristic of UNBC is that it has a strong focus on natural resources and environmentally oriented academic programs. The general upbringing of the participants (northern communities, rural), as well as the academic focus of the university are important to keep in mind as they can potentially skew the results, given that the studied sample might be a population having stronger environmental values than those of the average Canadian.

For the purposes of statistical power, I attempted to obtain a minimum of 400 participants. Respondents were university undergraduates enrolled in different degrees, with very different orientations. There were 432 completed surveys returned to me. The sample included students in the majors of Environmental Studies, Environmental Engineering, Health Sciences, Biology, and Commerce. There was also a population made up of students who completed the questionnaire but where not enrolled in the aforementioned degrees. All the students were either going through their first year in university or their fourth (or more). A

few returned surveys which were incomplete or had mistakes, therefore they were discarded. Table 1 shows the sample sizes for each program, and also the sizes by gender and by program within each academic program.

Table 3.1.

Number of students by program, and numbers by gender and year of studies

	Total n	Female	Male	1st year	4th year
Biology	55	30	25	24	31
Commerce	67	28	39	41	26
Environmental Studies	22	16	6	14	8
Environmental Engineering	37	18	19	21	16
Health Science	49	20	19	34	15
Other Programs	194				
Total	427	112	108	134	96

There were several reasons why students enrolled in these programs were chosen. The Environmental Studies program is based on understanding human-environment interactions, therefore students are expected to understand the implications of these interactions as well as to hopefully develop some empathy and concern for the natural world. My hypothesis was that Environmental Studies students would have the highest environmental values. The Biology program does not have as strong of a focus on human-environment interactions as Environmental Studies, but has a much deeper understanding of natural systems and how they work. As well, their constant fieldwork in natural settings holds the potential of generating in students deeper emotional connections to nature (Chawla, 1998, 1999). The Environmental Engineering program takes an engineering and technological approach to

environmental issues; the particular interest of studying the values, concern and believes in economic growth and technological development for students majoring in this program lies in looking at the relationships between altruistic values and beliefs in growth and technology to find whether there can be a positive relation between these. Students majoring in the Commerce academic program were expected to have the lowest environmental values. The hypothesis was that students majoring in programs with a strong economic rationale will be less environmentally friendly than students in disciplines conventionally considered liberal (Hodkinson & Innes, 2001). The purpose of studying the values of students in this major was to test the aforementioned hypothesis. Health Science was chosen for being a science without a focus on the natural world, but which does promote an ethic of caring for others. It would be interesting to see if Benevolence values are stronger in this program and, in the case that this ethic of care for other human beings existed, if it was extended to other non-human beings and the environment (Universalism values) along with a predominant ecocentric source of concern for nature.

3.2. Design and Procedure

In order to collect the data for this research, closed ended questionnaires were distributed amongst university students at University of Northern British Columbia.

Two methods were utilized to administer the questionnaire. The first one was that I sat at a table in a common area of the university which had a high density of traffic. A poster was set in front of the table that said, "Participate on a voluntary research about students' values". A sealed box with a small opening big enough only to insert the completed questionnaires was provided on a separate table, which was also used for students to complete the questionnaire

with privacy. The second method was through the collaboration of professors. Faculty members at the University of Northern British Columbia were contacted and asked if they could distribute the questionnaire in their classes amongst their students. The professors contacted were all professors teaching either 100 or 400 level courses, within the degrees of Biology, Environmental Studies, Environmental Planning, Environmental Engineering, Commerce, and Health Sciences. I was interested in administering the questionnaires also amongst Computer Science students, but their numbers were too small to make a sizeable sample.

Four hundred and thirty two questionnaires were completed and returned. These were either completed during class time or filled in by interested students at the aforementioned table in one of the University's hallways. Neither the professors nor the students received monetary compensation for their help or participation in this study. Nevertheless, to facilitate the participation of students, a professor teaching a 100 level Biology course gave extra credits in the mid-term exam to those students who participated in the study. This course has one of the highest levels of enrolment at UNBC and it is mandatory for three of the academic programs studied in this research (Environmental Engineering, Biology, and Health Science). Therefore, the assistance provided by this professor allowed me to collect a large number of samples from first year students majoring in Environmental Engineering, Biology and Health Sciences.

It is important to mention that Environmental Studies and Environmental Planning were assessed as one group due to the low number of students in both of these degrees and the similarities between them. The sample had more Environmental Studies students than Environmental Planning students, for simplicity's sake this group is referred to throughout

this work as 'Environmental Studies'.

3.3 Materials

For the purpose of this study, closed ended questionnaires were used to gather the data. The reason for doing this was that there were instruments already in existence which could measure the variables I was interested in studying in this research. These instruments had shown statistical reliability in previous studies. Utilizing these instruments was an efficient method to gather a large amount of data about human values, environmental concern and perspectives on economic growth and technological development.

A five-page questionnaire was developed to measure:

- Attitudes and beliefs towards growth and technology,
- Human values,
- Environmental values, assessed through measurements of Ecocentrism and Anthropocentrism,
- Fourth year students' perceptions about their change in values throughout the time spent at university,
- Fourth year students' perceptions of the values that were fostered the most by their chosen academic program of studies,
- Age, gender, degree studied, year of studies in their undergraduate program

The environmental attitudes towards growth and technology were assessed utilizing the "NEP growth and technology scale" (Gigliotti, 1992). To develop this scale, Gigliotti used 11 items from a 22-item environmental attitude scale developed by Khun and Jackson (1989)

that reflects attitudes toward growth and technology. Responses were made on a 5-point Likert type scale, ranging from (1) Strongly disagree to (5) Strongly agree. "A low score reflects an attitude that economic growth is good and science and technology can solve our problems, whereas a high score reflects concern about environmental problems caused by growth and development and a belief that environmental problems can best be solved by human restrain" (Gigliotti, 1992, p.17). Table 2 shows the NEP Growth and Technology scale and the items included in it.

Table 3.2.

New Environmental Paradigm Growth and Technology Items (Gigliotti, 1992)
Science and technology often do as much harm as good.
More emphasis should be placed on teaching children about nature than on teaching them about science and technology.
More emphasis should be placed on teaching children about nature than on teaching them about science and technology to solve our problems.
We cannot keep counting on science and technology to solve our problems.
Humans must live in harmony with nature in order to survive.
Rapid economic growth often produces more problems than benefits.
Humans are severely abusing the environment.
Canadian citizens are going to have to reduce their consumption of material goods over the next few years.
In general, Canadian citizens would be better off if the nation's economy stopped growing.
The positive benefits of economic growth far outweigh any consequences.
Most problems can be solved by applying more and better technology.

Ecocentric and Anthropocentric beliefs and sources of concern for the environment were measured using Thompson and Barton's (1994) scale. Responses on this scale were also made on a 5-point Likert type scale. The response scale was (1) *Strongly Disagree* to (5) *Strongly Agree.* The twelve items on the ecocentric scale expressed appreciating nature for its own sake, positive affect and stress reduction associated with being out in nature, and seeing a connectedness between human and non-human beings. The twelve anthropocentrism items reflected a concern with environmental issues primarily because of their effects on human

quality of life and survival. The items for the "NEP growth and technology" and the items from the anthropocentric-ecocentric scales were combined to form section 1 of the questionnaire.

Table 3.3
Ecocentrism-Anthropocentrism Scale Based on Thompson & Barton's (1994) Ecocentrism, Anthropocentrism, and Environmental Apathy Scale

Ecocentrism
One of the worst things about overpopulation is that many natural areas are getting destroyed for development.
I can enjoy spending time in natural settings just for the sake of being out in nature.
Sometimes it makes me sad to see forests cleared for agriculture.
I prefer wildlife reserves to zoos.
I need time in nature to be happy.
Sometimes when I am unhappy I find comfort in nature.
It makes me sad to see natural environments destroyed.
Nature is valuable for its own sake.
Being out in nature is a great stress reducer for me.
One of the most important reasons to conserve is to preserve wild areas.
Sometimes animals seem almost human to me.
Humans are as much a part of the ecosystem as other animals.
Anthropocentrism
The worst thing about the loss of the rain forest is that it will restrict the development of new medicines.
The best thing about camping is that it is a cheap vacation.
It bothers me that humans are running out of their supply of oil.
Science and technology will eventually solve our problems with pollution, overpopulation, and diminishing resources.
The thing that concerns me most about deforestation is that there will not be enough lumber for future generations.
One of the most important reasons to keep lakes and rivers clean is so that people have a place to enjoy water sports.
The most important reason for conservation is human survival.
One of the best things about recycling is that it saves money.
Nature is important because of what it can contribute to the pleasure and welfare of humans.
We need to preserve resources to maintain a high quality of life.
One of the most important reasons to conserve is to ensure a continued high standard of living.
Continued land development is a good idea as long as a high quality of life can be preserved

Section 2 of the questionnaire assessed the values of students. For this purpose, values were

measured using items from Schwartz's values survey (Schwartz, 1992). Since the questionnaire's length was already long, I looked for shorter alternatives to Schwartz's questionnaire. Schultz & Zelezny's (1999) version of Schwartz's (1992) value scale still filled the purpose of analyzing all 10 motivational categories of values (Power, Achievement, Universalism, Benevolence, Tradition, etc), but shortened the items measured from 56 to 37. These authors selected the four items with the greatest frequency of occurrence in each of the ten motivational categories of values across a sample of over 2000 students from 14 different countries (these value instruments are shown in Table 4). Each of the value-items was rated 'as a guiding principle in my life' from (-1) being "opposed to", (0) being "not important", to (7) being "extreme importance".

Section three of the questionnaire was divided into two sub-sections. The first part asked students to reflect upon their values back to the time right before they started university, and to think about how their values changed (or did not). Only items of the Universalism and Power categories of Schultz and Zelezny's (1999) value instrument were assessed in this section. The reason for limiting the values assessed in this sub-section to only two of the value categories described by Schwartz (1992) was because these were the categories which showed strong correlations with environmental behavior in previous studies (e.g. Karp, 1996; Stern & Dietz, 1994; Schultz & Zelezny, 1999). These studies demonstrate that people with strong universalism values tend to act pro-environmentally, while people with strong power values showed weak pro-environmental behavior, behavioral intent, or environmental attitudes. Students were asked to rate each value, answering if the value "became stronger",

Table 3.4.

Schultz & Zelezny's (1999) Adaptation of Schwartz's (1992) Value Instrument

Self-Transcendence	**Self-Enhancement**
Universalism	**Power**
Protecting the Environment	Social Power
A world of Beauty	Authority
Unity with nature	Wealth
Broad-minded	Preserving my public image
Benevolence	**Achievement**
Helpful	Successful
Honest	Capable
Loyal	Ambitious
Forgiving	Influential
Openness to Change	**Tradition**
Self-direction	**Tradition**
Creativity	Devout
Curious	Respect for tradition
Freedom	Humble
Choosing own goals	Moderate
Stimulation	**Conformity**
Daring	Politeness
A varied life	Honoring parents and elders
An exciting life	Obedient
Hedonism	Self-discipline
Pleasure	**Security**
Enjoyment of life	Clean
	National security
	Social Order
	Family security

"did not change", or "became weaker". Became stronger was rated as 1, did not change was rated 0 (zero), and became weaker was rated -1. The second part of section 4 asked students to respond to the question, "Choose the five values you think were fostered the most by your program of studies". To respond to this, a list of 37 values was made available to participating students. These value items were taken from Schultz and Zelezny's (1999) shortened version of Schwartz's (1992) value instrument, and were the same ones that were measured in section two of this study.

3.4 Reliability of the scales

The reliability of the scales (Cronbach's alpha) was first pilot tested for a sample of 26 Biology students (1st and 4th year). The results showed Alpha scores above 0.7 for most scales. The results obtained from the pilot test allowed me to move forward with the utilization of these scales for the whole sample. Table number 5 shows the alpha scores for all the scales, taking into account the data of the 432 surveys that were completed and returned.

Table 3.5.

Reliability of the Scales

Scale	Cronbach's Alpha	N of items
Growth and Technology	.49	11
Ecocentrism	.82	12
Anthropocentrism	.76	12
Universalism	.68	4
Benevolence	.71	4
Power	.70	4
Achievement	.70	4
Self-direction	.63	4
Stimulation	.63	3
Hedonism	.61	2
Tradition	.56	4
Conformity	.59	4
Security	.59	4

3.5 Statistical Analysis

The data collected was inputed into the program SPSS. After the data collected in each questionnaire was inputed into the data file, it was reviewed in order to make sure no

mistakes were made. This process was long, but by comparing the data inputted with the data in the surveys, mistakes made while inputting the data were spotted and corrected. The utilization of descriptive statistics allowed me to find any data which had values outside of the range specified for that particular question. This helped clear out potential errors done throughout the data input stage which were not spotted through the data review process.

Once the data was reviewed to make sure there were no anomalies, the SPSS software was utilized to analyze the data. The first step was to check for normality of the data. The graphs that were done with the descriptive statistics functions showed that the data followed normal distributions.

SPSS was then used to analyze the correlations between the different variables studied. After this stage was completed, this software was utilized once again to do a multivariate analysis of statistics to look for differences in the results amongst UNBC degrees, amongst years of studies, and between genders, as well as the intersections of programs-year of study, program-gender, gender-year of study, and program-gender-year of study.

To analyze section three of the questionnaire, which asked students to reflect on how the years spent in university changed (or did not) their Universalism and Power values, I used SPSS only to compute the mean scores. No further statistical analysis was required for this section since the results of this section were intended to be only descriptive.

SPSS was also used for the statistical analysis of the data gathered from the last section of the questionnaire, which asked students to state which five values were fostered the most by their program of studies. Once again, the intention of this section was to describe the students' perceptions on this matter. Therefore, SPSS was used only to compute the descriptive

statistics pertinent to this section and to generate graphs portraying how many students (percentage) in each degree stated that each value was fostered by their program of studies.

Chapter Four

Results

4.0. Introduction

This study seeks to better understand the impact that higher education has on environmental values. It also tries to assess the different impacts that different academic programs of study have on the environmental values of the students majoring in each program. The focus is placed on assessing the change in university students' values towards the environment throughout the years spent in university. Regardless of this, the data gathered also provides other very interesting insights. The values of students, their sources of concern for the environment (anthropocentric and ecocentric) and their perspectives on economic growth and technology were analyzed by making comparisons between programs, between first and fourth year classes within the programs and between genders.

In order to address the research questions of this study, this chapter will present the following results:

- Correlations of the results of the 10 value categories of Schwartz with the results of the scales of Growth and Technology, Anthropocentrism, and Ecocentrism.
- Gender differences in values, environmental concern and beliefs in economic growth and technology.
- Differences based on the academic program of study in values, environmental concern and beliefs in economic growth and technology.
- Differences between first and fourth year students' values, environmental concern and beliefs in economic growth and technology.
- Fourth year students' self reported changes in the values of Universalism and Power.
- Fourth year students self reported perceptions of the values which were fostered the

most by their chosen academic degree.

4.1. Relations amongst the studied variables

The first results that will be shown in this chapter are the correlations between the dependent variables studied. I calculated the correlations between, each of the value categories proposed by Schwartz (1992) and the variables of Growth and Technology, Anthropocentrism and Ecocentrism. This was done in order to better understand the relations between students' general values and their environmental values and beliefs in economic growth and technology. This information is useful in order to have a better understanding of the implications of the students' value system on their environmental values and beliefs system.

There were many significant findings present in the analysis of the existing correlations between the dependent variables. The correlations between the 10 value categories of Schwartz (1992) and the scales of Ecocentrism/Anthropocentrism (Thompson and Barton, 1994), and beliefs in Growth and Technology (Gigliotti, 1991) were tested. These results can be found in Table 4.2.

The results of the correlations between the studied variables showed results very similar to those attained by previous studies mentioned in the literature review, especially those of Schultz & Zelezny (1999), but with a few exceptions and with some new findings due to the incorporation of the Growth and Technology variable. The effect sizes (strength of the relations) were considered small when $.1 < r < .3$, medium when $.3 < r < .5$, large when $r > .5$. Beliefs in Growth and Technology showed negative, strong relations with Ecocentrism and Universalism, and weak (small) negative relations with Benevolence and Self-Direction

Table 4.1.

Number, Mean and Standard Deviations

	Mean	Standard Deviation	Number
Growth and Technology	3.47	0.55	417
Anthropocentrism	2.90	0.54	414
Ecocentrism	3.97	0.53	413
Universalism	4.98	1.22	421
Benevolence	5.56	0.99	416
Power	3.23	1.38	421
Achievement	4.73	1.15	423
Self-Direction	5.31	1.00	421
Stimulation	4.77	1.22	418
Hedonism	5.58	1.10	427
Tradition	3.96	1.30	405
Comformity	4.78	1.09	426
Security	4.52	1.14	424

Table 4.2.

Correlations Between Dependent Variables

	Growth & Technology	Anthropocentrism	Ecocentrism
Growth & Technology			
Anthropocentrism	-.43**		
Ecocentrism	.68**	-.29**	
Universalism	.54**	-.13**	.62**
Benevolence	.27**	-.07	.32**
Power	-.37**	.45**	-.33**
Achievement	-.13**	.29**	-.05
Self-Direction	.17**	.01	.23**
Stimulation	.08	.11*	.17**
Hedonism	.08	.08	.18**
Tradition	.06	.21**	.04
Comformity	.01	.17**	.01
Security	-.17**	.33**	-.14**

*significant at the $p < 0.05$ level

**significant at the $p < 0.01$ level

$0.1 < r < 0.3$ Small effect size

$0.3 < r < 0.5$ Moderate effect size

$0.5 < r$ Large effect size

values. Growth and Technology also showed positive relations with Achievement (small size effect), as well as medium size effects in the correlations with Power and Anthropocentrism. Anthropocentrism showed similar results to Growth and Technology. The values that related positively to it were values of Power and Achievement (Self-enhancement values) and values Tradition, Conformity, and Security (Tradition values). Power and Security had moderate relations, while Achievement, Tradition and Conformity showed weak relations with Anthropocentrism. Ecocentrism and Universalism showed weak negative relations to Anthropocentrism. Finally, Ecocentrism was predicted by Self-transcendence values (strong relation to Universalism and moderate with Benevolence) and by Openness to Change values (Self-Direction, Stimulation, Hedonism all showed small effect sizes). Security and Power showed negative relations (weak and moderate in strength, respectively).

Therefore, we can see how Universalism and Benevolence values (Self-Transcendence values) were predictive of Ecocentrism concern and a lack of belief in economic growth and technological solutions to environmental problems. Meanwhile, values of Power and Achievement were predictive of Anthropocentric environmental values (caring for nature only when the wellbeing of the affected environment has a direct negative effect on the individual or mankind) as well as of a strong belief in economic growth and technological solutions to environmental degradation. Tradition (Comformity, Tradition, Security) values showed moderate positive correlations with Anthropocentrism, meaning that people with conservative worldviews have a stronger tendency to care for nature for egoistic rather than altruistic reasons. Meanwhile Openess to change values (Self-direction, Stimulation, Hedonism) showed moderate correlations to Ecocentrism, meaning that people with

independent personalities and a high regard for the enjoyment of life will show a higher concern for nature due to altruistic rather than egoistic reasons. This signifies an ethic of care for nature due to its intrinsic value and not for the effects that its degradation will have exclusively on the individual and humankind).

These results confirm the literature review in terms of the implications that Self-enhancement and Self-transcendence values have for environmental values, attitudes and concern. But also it showed that the Openness to change to Tradition continuum of values also has a statistically significant, small or moderate effect on environmental values. The implications of these results on the values of students will be further discussed in the next chapter (Chapter Five).

4.2 Environmental values of students: differences by gender, year of studies, and program of studies.

Through the utilization of multivariate statistical analysis, the data was analyzed to determine whether there were any differences between the program of study (Biology, Commerce, Environmental Studies, Environmental Engineering and Health Sciences), between first and fourth year samples, and between genders. Also, the interactions of these independent variables were computed (program and gender, program and year, gender and year, and program, gender and year). A two-factor between-groups multivariate analysis of variance (MANOVA) was performed to investigate the differences in environmental values of students depending on their program of studies, the year in the program (1^{st} and 4^{th}) and their gender. Seven dependent variables were used: 1) Beliefs in Economic Growth and Technology as

solutions to environmental degradation; 2) Ecocentrism; 3) Anthropocentrism; 4) Universalism; 5) Benevolence; 6) Power; 7) Achievement. The independent variables were gender, year of studies (two levels: first or fourth year), and program of studies (5 levels: Biology, Commerce, Environmental Studies, Environmental Engineering, and Health Sciences). Multivariate analysis of variance was preferred over a series of ANOVAs because it gives a higher degree of protection against inflated Type I error due to multiple tests of correlated dependent variables and because, under certain conditions, it may reveal differences not shown in separate ANOVAs (Tabachnick & Fidell, 1989, p.372).

Table 4.3 shows the results of the MANOVA, showing the statistically significant differences (or lack of them) between the levels of the independent variables tested (gender, program of studies, year in university). Due to the large number of correlated dependent variables (7), the statistically significant level was set at .01 instead of .05. Therefore, this table shows whether there were significantly different results between male and female students, between the different program studied, and between first and fourth year students.

Table 4.3.
MANOVA multivariate test for differences in variances within the groups of each independent variable and their interactions

Effect	Pillai Statistic	F	Effect df	Error df	p	Partial Eta Squared
Program	.473***	3.278	28	684	.000	.118
Gender	.134***	3.714	7	168	.001	.134
Year	.065	1.667	7	168	.120	.065
Program x Gender	.149	.943	28	684	.552	.037
Program x Year	.189	1.209	28	684	.213	.043
Gender x Year	.022	.537	7	168	.805	.022
Program x Gender Year	.208	1.338	28	684	.116	.052

*** $p < 0.005$; ** $p < 0.01$

The Pillai's Trace test was used in this analysis instead of Wilks' Lamda for the multivariate test due to the small number of the samples and the higher variance found between them, this makes for a more rigorous analysis of the data (Tabachnick & Fidell, 1989). I did not find statistically significant differences on the interactions between year and gender, year and program, and program and gender. As Table 4.3 shows, neither were any statistically significant differences found between the first year students' sample and the fourth year student's sample for any of the degrees studied. However, statistically significant differences were found between students majoring in different academic programs and between male and female samples. The Partial ETA squared, which describes the proportion of total variation attributable to a particular factor, excluding other factors from the total non error variation, shows that only the differences between programs and between genders have at least medium effect sizes, partial eta squared > .09 (Levine & Hullet, 2002).

I will first analyze the differences found between the genders. The multivariate analysis of statistics shows that there are statistically significant differences only for the variables Growth and Technology and Anthropocentrism. This data can be seen in table number 4.5, while Table 4.4 shows the means and standard deviations of each gender for each of the dependent variables.

Table 4.4.
Mean and Standard Deviation Scores for Male and Female Samples

	FEMALE	MALE
Growth and Technology	3.60 (0.52)	3.27 (0.55)
Anthropocentrism	2.77 (0.56)	3.13 (0.52)
Ecocentrism	4.10 (0.47)	3.78 (0.54)
Universalism	5.39 (1.04)	4.62 (1.31)
Benevolence	5.80 (0.85)	5.39 (1.06)
Power	3.28 (1.54)	3.59 (1.26)
Achievement	4.76 (1.20)	4.79 (1.12)

Mean (Standard deviation)

Table 4.5.
Test of Between-Subjects effect for Gender

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	p	Eta Squared
Gender	Growth & Technology	132.92	1	132.92	5.80	.017	.032
	Anthropocentrism	645.10	1	645.10	19.60	.000	.101
	Ecocentrism	95.88	1	95.88	3.55	.061	.020
	Universalism	62.79	1	62.79	3.35	.069	.019
	Benevolence	31.19	1	31.19	2.31	.130	.013
	Power	20.97	1	20.97	0.68	.408	.004
	Achievement	.03	1	0.03	0.00	.96	.000

Males scored lower in the Growth and Technology scale (meaning that they have more faith in economic growth, market based solutions, and in technological development in order to solve the environmental crisis), but the size effect was only small (eta squared > 0.01). Males scored higher in the Anthropocentrism scale than females, this means that men find a more utilitarian value in nature than women do (medium size effect, having an eta squared >0.09).

Having analyzed the results of the multivariate analysis of statistics based on gender, it is important now to address the results found based on academic program of studies. Looking back to the research questions proposed in this study, the most important question to answer is that of what is the impact of university education on environmental values. The multivariate analysis of variance showed that there were no differences between the values of the samples of first and fourth year students. This suggests that education does not have a significant impact on the values of students (Table 4.3).

The next question to ask, however, is whether the values of students are different from one program to another. The multivariate analysis of variance did show significant differences based on the academic program of studies. Table 4.6 shows the results of the multivariate analysis of variance's test of between-subjects effects for academic programs.

Table 4.6.

Test of Between-Subjects Effects Based on Academic Program of Studies

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	p	Eta Squared	Effect size
Program	Growth & Technology	1560.23	4	390.05	17.02	.000	.28	L
	Anthropocentrism	678.99	4	169.74	5.15	.001	.10	M
	Ecocentrism	1715.41	4	428.85	15.91	.000	.26	L
	Universalism	520.50	4	130.12	6.94	.000	.13	M
	Benevolence	134.25	4	33.56	2.49	.045	.05	S
	Power	616.79	4	154.20	5.05	.001	.10	M
	Achievement	156.78	4	39.19	1.81	.129	.04	

Effect size: **small** eta squared > 0.01; **moderate** eta squared > 0.09; **large** eta squared > 0.25

Table 4.6 shows that there are statistically significant differences between academic programs for six out of the seven dependent variables studied. The statistically significant differences were found for the variables of Growth and Technology, Ecocentrism, Anthropocentrism, Universalism, Benevolence (only significant at the $p < 0.05$ level), and Power. No statistically significant differences were found for Achievement. The ETA squared showed that the Growth & Technology and Ecocentrism had large size effects, Anthropocentrism, Universalism, and Power had medium sized effects, and that Benevolence had a small size effect. The size effects shows how much variance is explained by each factor. Eta-squared describes the ratio of variance explained in the dependent variable by a predictor while controlling for other predictors (Levine & Hullet, 2002).

Table 4.7 shows the mean scores for each of the dependent variables (Growth and Technology, Ecocentrism, Anthropocentrism, Universalism, Benevolence, Power and Achievement) across the different academic programs studied.

Table 4.7.
Mean scores of Students in each Academic Program

	Biology N= 55 Mean (sd)	Commerce N= 67 Mean (sd)	Environmental Studies N= 22 Mean (sd)	Environmental Engineering N= 38 Mean (sd)	Health Sciences N= 49 Mean (sd)
Growth & Technology	3.67[a] (0.47)	3.07 (0.45)	4.03 (0.42)	3.62[a] (0.53)	3.30 (0.44)
Anthropocentrism	2.75[a] (0.58)	3.16[b] (0.51)	2.61[a] (0.52)	2.78[a] (0.59)	3.12[b] (0.47)
Ecocentrism	4.17[a] (0.38)	3.58 (0.54)	4.38 (0.41)	4.07[a] (0.46)	3.91[a] (0.43)
Universalism	5.28[a] (1.06)	4.37 (1.34)	5.95 (0.96)	5.22[a] (1.11)	5.04[a] (1.06)
Benevolence	5.84[a] (0.85)	5.25 (1.06)	5.69[a] (1.18)	5.69[a] (0.73)	5.75[a] (0.94)
Power	2.65 (1.52)	4.00[b] (1.16)	3.09[a] (1.30)	3.11[a] (1.33)	3.92[b] (1.27)
Achievement	4.38 (1.27)	5.01 (1.02)	4.63 (1.29)	4.49 (1.01)	5.19 (1.08)
Self-Direction	5.33 (1.08)	5.27 (0.96)	5.44 (1.34)	5.31 (0.89)	5.42 (0.81)
Stimulation	4.61 (1.31)	4.94 (1.18)	5.22 (1.15)	4.80 (1.08)	5.00 (1.00)
Hedonism	5.50 (1.09)	5.72 (1.19)	6.06 (0.76)	5.64 (1.01)	5.64 (1.16)
Tradition	3.87 (1.34)	3.99 (1.25)	3.78 (1.55)	3.29 (1.24)	4.51 (1.20)
Comformity	4.69 (1.18)	4.80 (0.96)	4.46 (1.22)	4.45 (0.97)	5.25 (1.00)
Security	4.17 (1.15)	4.78 (1.09)	4.12 (1.28)	4.29 (1.05)	5.10 (1.03)

Superscript letters show groups which are not statistically significantly different from each other.

In order to better portray the whole range of values present in students in different degrees, the values of Openess to Change (Stimulation, Self-Direction, Hedonism) and Tradition (Tradition, Conformity, Security) were also included in this table, even though they were not included in the multivariate analysis of statistics because there was little evidence of relations between them and environmental attitudes or behavior in the studies presented in the literature review. In Table 12, the superscripted letters located besides the scores show groups of variables which had no statistically significant differences between samples from different academic programs according to the post-hoc analysis of the multivariate analysis of statistics done with SPSS.

Table 4.7 shows the different values of students in different degrees. It shows how either students in Environmental Studies or Biology always ranked highest on the values that, in the literature review, showed a positive correlation with environmental behavior (Growth and

Technology[2], Ecocentrism, Universalism, and Benevolence). They also ranked lowest for Power, Achievement, and Anthropocentrism, which are the values with negative correlations to environmental behavior. The post-hoc test (using the LSD test to achieve higher statistical power) shows how there are no statistically significant differences between the students' samples of Biology and Environmental Studies. The case of Commerce students was virtually opposite to that of Environmental Studies and Biology. Commerce students had the lowest environmental values for every category. An interesting case is that of Health Science students. The values of students in Health Sciences show several contradictions with the value model expressed by Schwartz (1992). These students show the strongest egoistic values (high scores in Anthropocentrism and Power, low in Growth and Technology) and were not significantly different from Commerce students for the Anthropocentrism and Power variables. Nevertheless, their score for Benevolence, Universalism and Ecocentrism were very similar to those of Environmental Engineering and Biology Students. The interesting thing about students in this program is that they showed high scores for both Egoistic and Altruistic values as well as for both environmental value types (Anthropocentric and Ecocentric). Environmental Engineering students' environmental values were usually third, falling in between Biology and Health Sciences.

Table 4.8 shows the ranking of general values (as described by Schwartz, 1992) within each program (only the value categories of Schwartz are used in this table).

[2] Higher score means a lower belief in this Economic Growth and Technology as ultimate solutions to environmental problems.

Table 4.8.

Value ranking by Program and Comparison with UNBC Mean and with Schwartz and Bardi (2001) results.

Schwartz & Bardi (2001)	UNBC Mean	Biology	Commerce	Env. Studies	Env. Eng.	Health sci.
Benevolence	Hedonism	Benevolence	Hedonism	Hedonism	Benevolence	Benevolence
Self-Direction	Benevolence	Hedonism	Self-Direction	Universalism	Hedonism	Hedonism
Universalism	Self-Direction	Self-Direction	Benevolence	Benevolence	Self-Direction	Self-Direction
	Stimulation	Universalism		Self-Direction	Universalism	Conformity
Security	Universalism	Conformity	Stimulation	Stimulation	Stimulation	
Comformity	Conformity	Stimulation	Conformity			Security
Hedonism			Security	Conformity	Conformity	Universalism
Stimulation	Security	Security	Universalism	Security	Security	Stimulation
Tradition	Tradition	Tradition		Tradition	Tradition	Tradition
			Tradition			

Green: Self Transcendence
Red: Self Enhancement
Blue: Self-Direction
Yellow: Tradition/Conservation

The Colors on Table 4.8 were placed so that the reader can more easily identify the pattern of values with green being Self-Transcendance (Altruistic) values, red being Self-Enhancement (egoistic) values, blue being Openness to Change values, and yellow being Tradition values. First of all, we can see that the Power value category falls last for every single degree except Commerce, followed by Tradition (with the exception of Commerce students, that ranked Power before Tradition). This is not only true for all the programs studied, but also for UNBC's mean scores and for the results found by Schwartz and Bardi (2001) on a multicultural study. This shows that even students in Commerce, who had the highest score for Power, still ranked it as one of its least endorsed value categories. Achievement, the other Self-Enhancement/Egoistic value category, ranked higher for Commerce students than for

everyone else, but as shown in Table 4.6 (Multivariate test), there were no statistically significant differences for the Achievement value category. Therefore, before demonizing Commerce students for having the highest egoistic values, it is important to notice that the Power value category is ranked last for this group too, and that Achievement is not statistically significantly different from any other sampled group.

In terms of where Self-Transcendence/Altruistic values rank, here we can see a considerable lack of endorsement of the values of Universalism for Commerce students. Health Science students ranked it seventh out of ten, and Commerce students ranked it eighth. Yet, the universalism values of Health Science students are not significantly different from Biology students. This means that Health Science students have many values to which they give importance. Just to remind the reader, the Universalism category has a considerable biospheric content, since it includes the values Protect the Environment, A world of beauty, and Unity with Nature.

In more general terms, and with few exceptions, we can see how the value system of university students is dominated by Openness to Change values (Self-Direction, Stimulation, Hedonism) and by Self-Transcendence values (Universalism, Benevolence). Meaning that university students demonstrate an ethic of care for others (self-enhancement values), and value being independent, excitement and enjoying life (Hedonism, Self-Direction, Stimulation). Meanwhile, Tradition values (Conformity, Security, Tradition) and Self-Enhancement values (Power, Achievement) are usually found amongst the least endorsed values. Commerce and Health Science students are the exception to this, pushing Universalism to the eighth and seventh place, and with Health Science students having the traditional value Conformity ranked fourth.

4.2. Fourth year students self reported change in the values of Universalism and Power.

This section describes the perspectives of fourth year students on how their values changed from the day they started university, until the time they were surveyed. Only the values of Universalism and Power were assessed. Since a shortened version of the value scales of Schwartz (1992) was used in the questionnaire, I will mention once again which values were measured for each of the two value categories presented above. The Power category included the items Social Power, Authority, Wealth, and Preserving Public Image. The Universalism category included the items Protecting the Environment, A World of Beauty, Unity with Nature, and Being Broad Minded.

Table 4.9 shows the self reported perspectives of fourth year students on how their values changed throughout the years spent in university. For each value item, they could answer whether that value became stronger, stayed the same, or became weaker. Each time a student reported that a value became stronger, it would add a +1 to the score of that value category, when a student reported that a value became weaker, it would add a -1 to the score of that value category, and when they reported that the value stayed the same, then there would be no modification to the score of that category. This means that for each category, the scores could range from -4 to +4 (a +1/-1 for each of the 4 value items of each category).

As table 4.9 indicates, Biology students are the ones who reported the largest positive change in Universalism values (altruistic/biospheric values) with a mean of 2.84. Biology students are the ones who also reported the most negative change in Power values, with a mean of -0.80. Commerce students, on the other hand, showed the biggest positive change in Power

Table 4.9.
Fourth Year Students Self-Reported Change in the Values of Universalism and Power.

	Biology	Commerce	Environmental Studies	Environmental Engineering	Health Sciences
Power	-0.80	0.92	0.85	0.00	-0.26
Universalism	2.84	1.25	2.14	1.46	2.26

values. This change was not big, showing only an increase of 0.92. They also showed a positive change in Universalism values. Although this change was the smallest one amongst all the programs studied.

Once again, and with the purpose of making an honest portrayal of the values of students in different programs, I analyzed the percentage of students in each degree mentioning that the value Protecting the environment (a Universalism value) increased, stayed the same, or decreased. Table 4.10 shows these results.

Table 4.10.
Self-reported change in the value Protecting the Environment

	Biology N= 31	Commerce N= 26	Env. Studies N= 8	Env. Eng. N= 15	Health Sci. N= 15
Increased	93.55%	38.46%	75%	60%	60%
No change	6.45%	53.85%	12.5%	33.33%	40%
Decreased	0%	7.69%	12.5%	6.67%	0%

The results show how Biology and Environmental Studies students are the ones which mentioned that the value Protecting the Environment had changed positively the most. In particular, the case of Biology is interesting, since 93.55% of the students in this program believed that Protecting the Environment had become more important throughout the years spent at university. Sixty percent of Environmental Engineers and Health Science students believed that Protecting the Environment had become more important to them, while only a

38.46% of Commerce students believed that this value became more important throughout the four years spent at University.

The value of Power showed very different results. Out of the five academic programs studied, only two of them reported a positive change in Power (Commerce and Environmental Studies), but in both cases the change was small. This result was intriguing. It was expected that the Commerce students would report a moderate increase in the value of Power. This was not expected from Environmental Studies students. The literature review showed repeatedly how the value of Power correlated negatively to environmental attitudes and behaviour (e.g. Karp, 1996; Stern & Dietz, 1994; Schultz and Zelezny, 1999), therefore, an increase in the value of Power was not expected to be found in students majoring in an academic program which focuses on protecting the environment. Nevertheless, informal discussions with fourth year Environmental Studies students clarified and provided a rationale for what at first glance seemed to be a very big inconsistency with the existing literature. Students in Environmental Studies told me that they believed that in order to be able to make the hard decisions that need to be taken in order to preserve the ecological integrity of the environment, a considerable measure of social power and authority are needed. Both Social Power and Authority are values found under the category Power. These informal discussions raise the question of whether Power values, which are considered egoistic values, can actually have an altruistic meaning within some contexts.

With the intention of delving deeper into the concepts of post-materialistic values, the change in the value of "Wealth" was also assessed independently from the other Power vaues. Table 4.11 shows the percentage of students in each degree that believed that "Wealth" became

more important throughout the time they spent at university, stayed the same, or decreased in importance.

Table 4.13.
Self reported change in the value "Wealth"

	Biology N= 31	Commerce N= 24	Env. Studies N= 7	Env. Eng. N= 15	Health Sci. N= 15
Increased	25.8%	41.66%	42.86%	26.66%	6.66%
No change	32.2%	25%	42.86%	46.66%	66.66%
Decreased	41.94%	33.33%	14.28%	26.66%	26.66%

These results show how Commerce students and Environmental Studies students were the ones which experienced the biggest positive change in this value, meaning that Wealth gained in importance for them more than for students in other programs. It is important to compare this result to the score that these same groups have given to Wealth as a guiding principle in their lives. While fourth year Commerce students' average score for this value was 4.30 (on a Likert type scale which ranged from -1 to 7), Environmental Studies students only scored 1.87 using the same scale. While only 6.66% of Health Science students believed that Wealth became more important to them, those same students when asked to rank Wealth's importance as a guiding principle in their life, their mean score was 4.26 (also utilizing the -1 to 7 Likert type scale). This score was almost as high as Commerce students. This would suggest that more students in Commerce experience a positive change in materialistic values throughout the years spent in University. For Health Science students, even though they place the same importance as Commerce students on this value, fewer of these students reported an increase in the importance of it due to higher education. The program which demonstrated the largest percentage of students who believed that this value became less important to them was Biology; a result which confirms that these students endorse more post-materialistic values throughout the years they spend at university.

The next section in this chapter will focus on which values students believed were fostered the most by their program of studies. These results can help explain some of the changes seen in this section.

4.3. Values fostered by each academic program.

To examine the values fourth year students believed were fostered the most by their program of study, students were asked to mention the 5 values (out of the 37 values taken from Schwartz's (1992) value scale) which they believed were fostered the most by their program. There was no differentiation or ranking between the five values mentioned. The score presented for each value in Figure 4.1 is the percentage of students majoring in that particular degree who marked the value as one of the top 5 values fostered by their program. For example, the Universalism value category scores 2.29 for Biology students. This means that the average Biology student picked 2.29 of the four values that make up the Universalism scale. Figure 4.1 shows the comparison by degrees of the values student believe were fostered the most by their program of studies. According to these results students perceive universalism values as the ones that are fostered the most by their program of studies. Out of the five value categories that are most important for this research (Universalism, Benevolence, Power, Achievement, and Tradition) Benevolence and Power were the ones which were mentioned less frequently. Biology and Environmental Studies students reported very similar results, although Achievement seemed to be mentioned slightly more by Environmental Studies students.

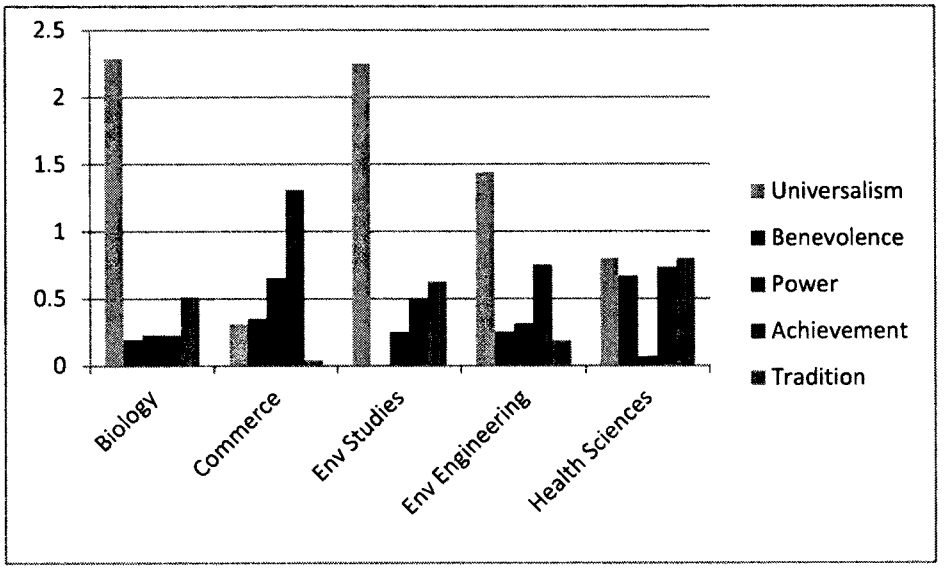


Figure 4.1. Values fostered by academic programs

Outside of the Universalism scale, the only values which were mentioned by 20% or more of Biology students were Respect for Tradition, Curious, Choosing Own Goals, and Self-discipline. Eighty seven percent of Environmental Studies students believed that Protecting the Environment was one of the values most fostered by their program of studies. This was the single highest score for any value in any of the five degrees studied. In second place came Unity with nature (62%), in third place came Respect for tradition (50%). Three more values appeared tied for fourth, with almost 40% of students choosing each of them. These were the two remaining values in the universalism category (A World of Beauty and Being Broad Minded) and Being Capable, a value in the Achievement category. Figure 4.2 shows the results for Environmental Studies students.

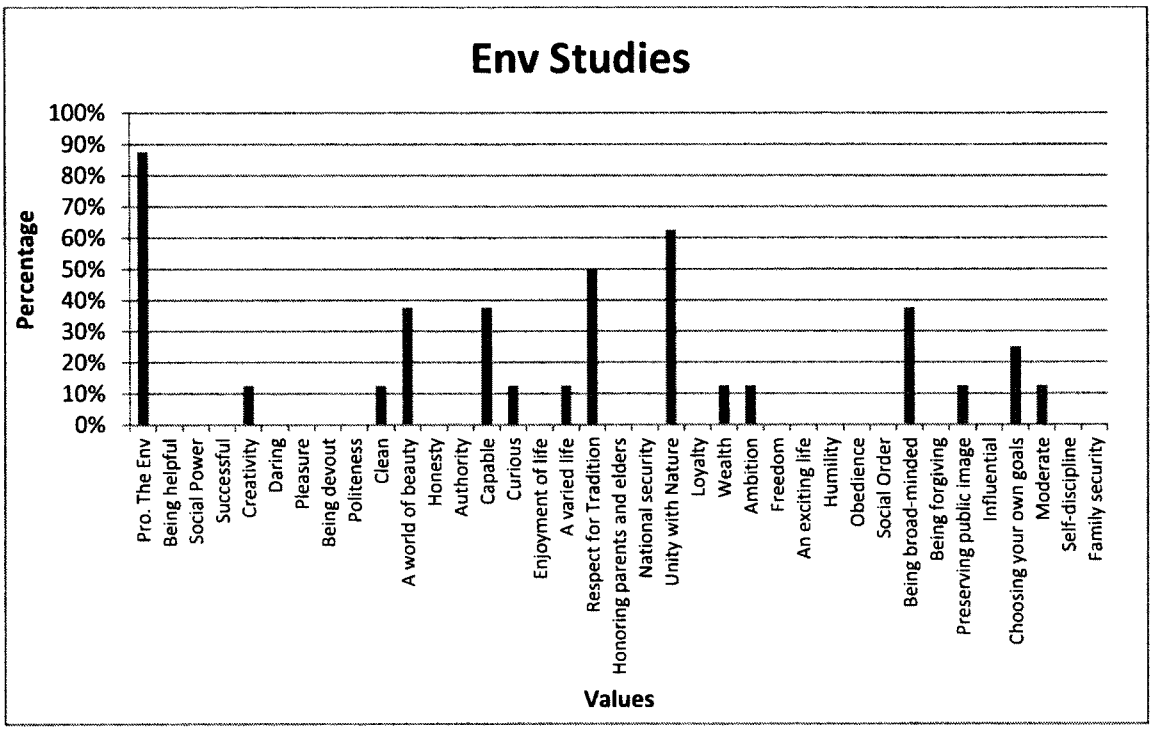


Figure 4.2. Students' beliefs of the values most fostered by the Environmental Studies program

Commerce students reported results which were very different from every other degree, with Tradition as the least mentioned values and Universalism as the second least mentioned. On the other hand, the Self-Enhancement/Egoistic value categories (Power and Achievement) were the ones most mentioned by Commerce students. Successful appeared as the most frequently marked value by Commerce students (62%) with Wealth and Ambition coming in second and third place. There were no surprises thus far, since Commerce students mean scores for values had ranked higher in the Power and Achievement scales than those of students in every other degree. The fourth and fifth most mentioned values by Commerce students were in the Self- Direction category. Choosing your Own Goals and Creativity were mentioned by over 25% of Commerce students. One of the interesting results of this section

is that the Benevolence value was fostered more (according to students) by the Commerce major than it was by Biology or Environmental Studies.

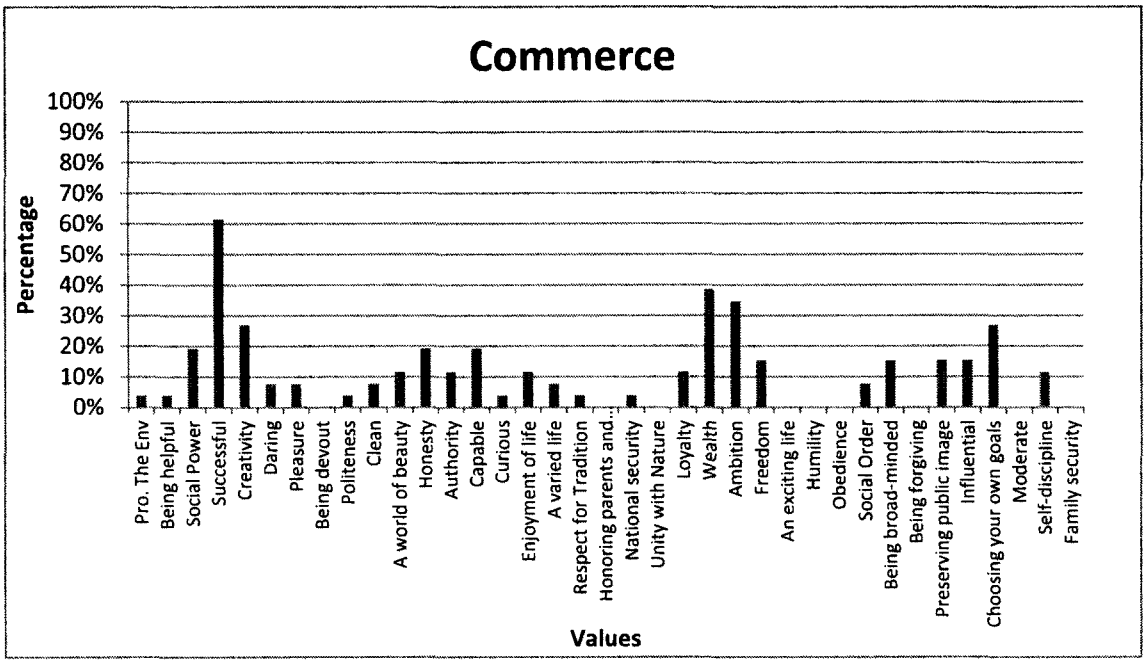


Figure 4.3. Students' beliefs of the values fostered by the Commerce program

Health Science students reported the most diverse answers, having no particular value category appearing significantly more often than the others. Health Science showed scores which were very similar for Universalism, Tradition (these two coming in first place) and Achievement and Benevolence (coming in a close second). Benevolence (a Self-Transcendence/Altruistic value category) ranked higher in Health Sciences than for any other degree. The reason for this diversity in the value categories is because Health Science students chose single values from different categories as the ones which were fostered the most by their program of studies. The two values that ranked higher were Respect for

Tradition (a Tradition value) and Being Broad Minded (a Universalism value) with 60% of students choosing them. The third ranked value belongs to the Conformity value category and it is the value Self-discipline (47%). The fourth is Ambition, a value belonging to the Achievement value category (40%), and the fifth ones were Creativity (a Self-Direction value), and Honouring Parents and Elders (another Conformity value) (33% each). As opposed to other degrees, which showed a strong value orientation in one direction (Universalism for Biology and Environmental Studies, and Self-Enhancement/Egoistic values in the case of Commerce), Health Science students reported a very broad range of values from different categories being almost equally important. One alarming result concerning Health Science students is that not a single one of them reported Protecting the Environment as one of the values fostered by their program of studies.

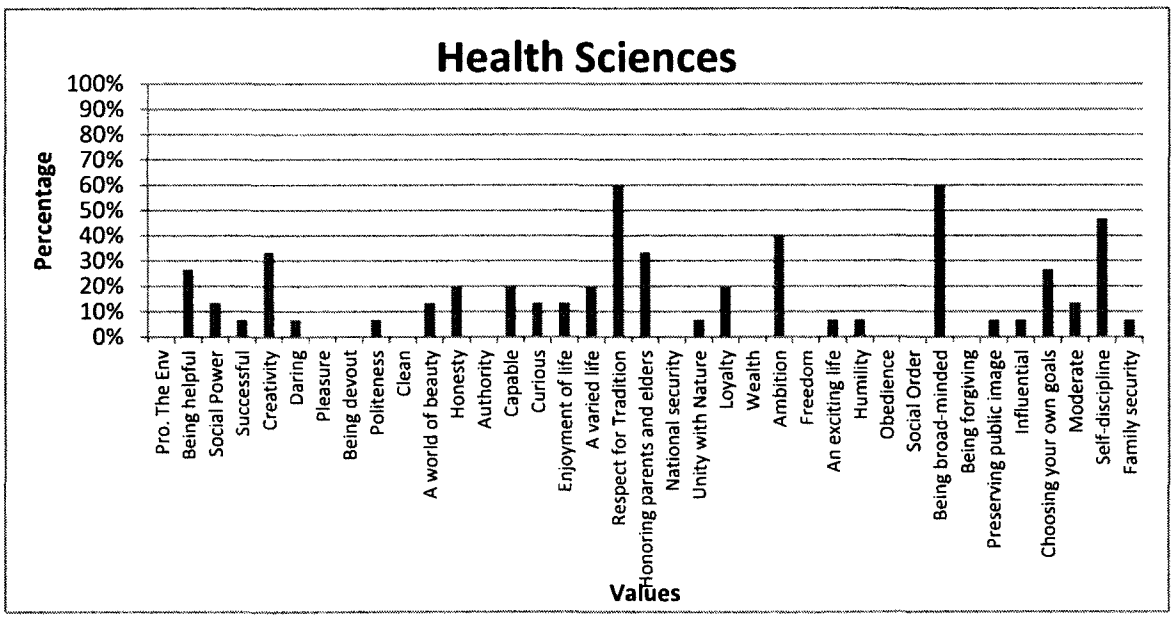


Figure 4.4. Students' beliefs of the values most fostered by the Health Science program

Environmental Engineering also shows Universalism values to be the most predominant values being fostered by the program, yet not as strongly as for Biology and Environmental Studies. Achievement and Self-direction come in a distant second place. In terms of the individual values, 75% of Environmental Engineering students believed that Protecting the Environment was one of the values which was fostered the most by their program of studies. Nevertheless, the other biospheric values of the Universalism category were barely mentioned (Unity with Nature and A World of Beauty). Broad Minded (another Universalism value), appears second place tied with Self-Discipline (a Conformity value), and Capable appears in fourth place (37%). It is important to note that even if the value Protecting the Environment appeared as the most fostered value for Environmental Engineering students, the other biospheric values (which have a higher emotional component in terms of a person's relation to nature) were not significantly present.

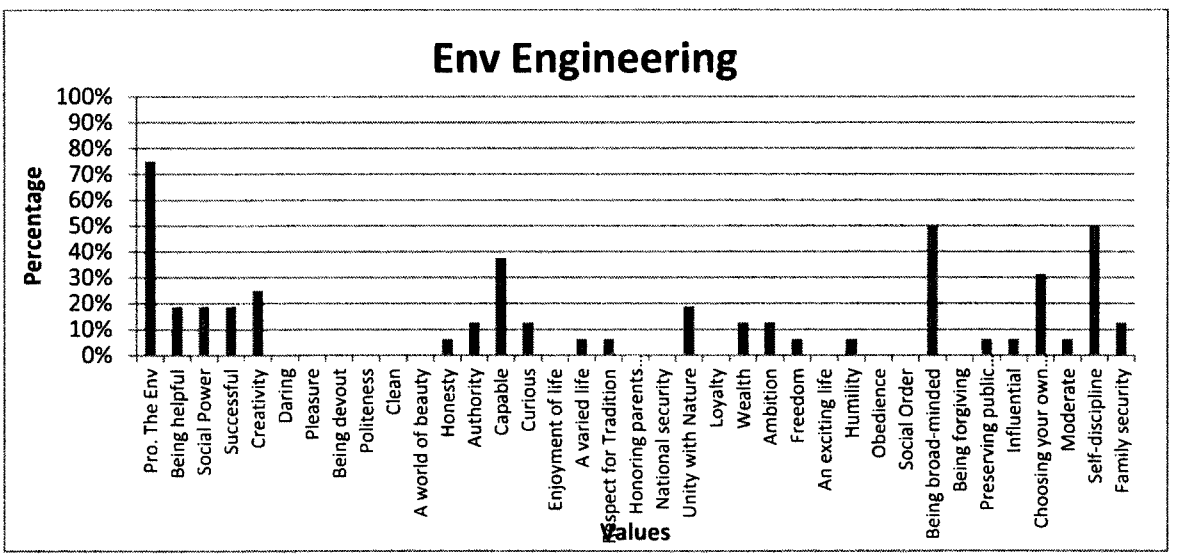


Figure 4.5. Students' beliefs of the values most fostered by the Environmental Engineering program

According to Biology students, the four values which were fostered the most by their academic program were all Universalism values, ranking Protecting the Environment in the first place, Unity With Nature and Being Broad Minded in the second, and "A World of Beauty" in third place.

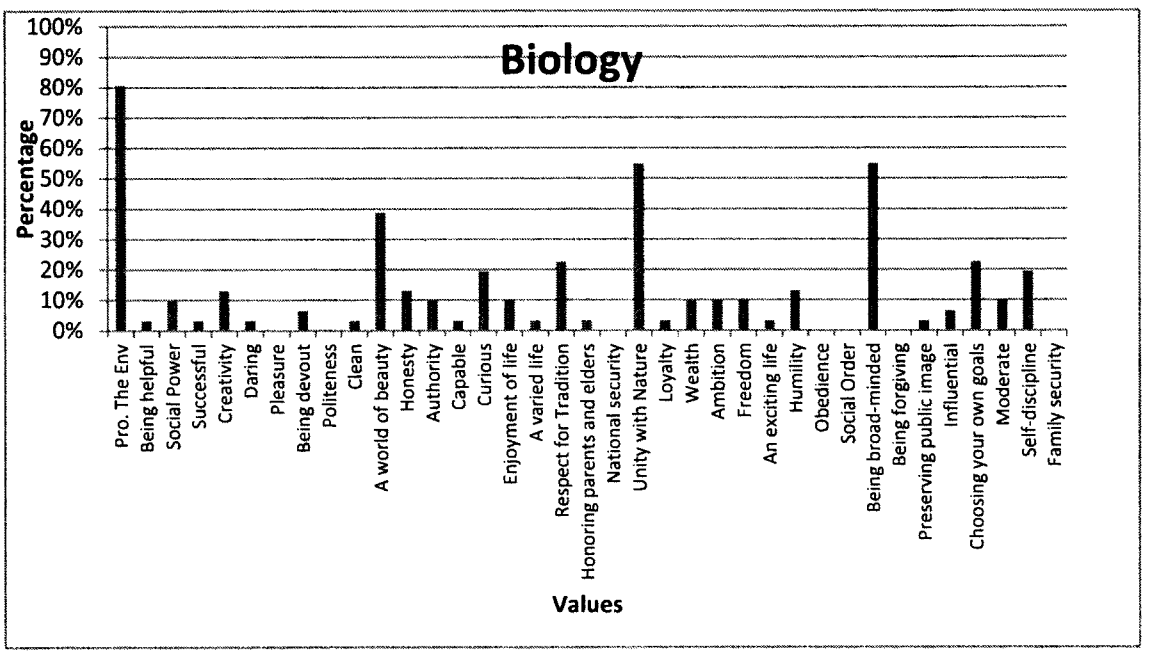


Figure 4.6. Students' beliefs of the values most fostered by the Biology program

4.5. Chapter conclusion

There are a few key items and relations that can be extracted from this data. The question that was meant to be answered was whether university education had an impact on the environmental values of students, and if there were differences and different impacts based on the program of studies students majored in.

When independent samples composed of first and fourth year students in each particular degree were compared, no statistically significant differences were found for any of the

dependent variables tested. Therefore, by comparing these two samples (first and fourth year students) in each academic program studied, we cannot assert that university education had an impact on students' values.

There were significant differences between students majoring in different academic programs. Biology and Environmental Studies students showed the highest environmental values (high Universalism, Benevolence, Ecocentrism and low Power, Anthropocentrism and beliefs in Growth and Technology) and Commerce students showed the lowest. Health Science students showed values which were very similar to those of Commerce students for the variables which have a negative impact on environmental behaviour (Growth and Technology, Anthropocentrism, Power and Achievement) but did not rank differently than Biology or Environmental Engineering in Universalism and Ecocentrism. Therefore they showed high egoistic values and moderate altruistic and ecocentric values. Environmental Engineering students' values were somewhere in between Biology and Health Sciences for most variables, usually ranking in the middle for each variable.

Commerce students ranked Universalism values amongst their least endorsed values (8^{th} out 10 for Commerce). This means that comparatively, their biocentrism values are not as important to them as other values. Regardless of this result, both Commerce and Health Science degrees ranked Power amongst their least endorsed value (10^{th} out of 10 for Health Science and 9^{th} out of 10 for Commerce), so their values were not significantly more egoistic than those of the other programs. All programs studied, except Commerce, showed the same result in terms of Power, ranking last for all cases.

When the values fostered by academic program were compared to the reported value systems and in particular to the change expressed by fourth year students throughout their four years at university, a few interesting relations appeared. Biology students mentioned that the four values which were fostered the most by their program of studies were all Universalism values. At the same time, it was Biology students who reported the highest level of change in Universalism values between first to fourth year (93.55% of Biology students believed that protecting the environment became more important as the years at university progressed). The results from the Environmental Studies students sample was similar in terms of values fostered by the academic program of studies, although the self reported change in Universalism values was not as big (75% stated that it increased). Nevertheless, it is important to remember that Environmental Studies students had reported the highest levels in Universalism values, so in many cases it could mean that it was already high. The data of the Health Science students' sample is the most intriguing. This group reported the second biggest change in Universalism values (second to Biology and even higher than Environmental Studies), yet Universalism does not have as strong of a presence in terms of values fostered by the academic program as Environmental Studies or Environmental Engineering does. Further inquiry of a qualitative nature needs to be done to understand this data. But even if the change in Universalism as a whole was the second largest, only 60% of Health Science students stated that Protecting the Environment was a value that became stronger through the four years at university. Only Commerce students reported a smaller change in this value. Another result worth remarking upon is that not a single Health Science student mentioned that Protecting the Environment was a value fostered by their academic program of study.

Chapter Five

Discussions

5.1. Introduction

The main question asked in this study was whether the university experience and choice of a particular academic program of studies had impacts on the environmental values of students. To answer this main question, several findings will be discussed and contrasted with the literature. This discussion will be focused around three topics: 1) On average, do UNBC students show a concern about the environment? 2) Do students in different programs differ in their values? 3) Does university contribute to the differences we see in the values of students from different academic programs?

5.2. On average, do UNBC students show a concern about the environment?

This study asked students in different academic programs about their beliefs in economic growth and technological solutions, about their general values, and their environmental values. Beliefs in Economic Growth and Technology, and the environmental values of Ecocentrism and Anthropocentrism were rated on a Likert type scale ranging from (1) Strongly disagree, to (3) Neutral, to (5) Strongly agree. The general human values, as described by Schwartz (1992), were measured on a different Likert type scale, ranging from (-1) Opposed to, (0) Not important, to (7) Extreme importance. It is important to mention this once again so that an assessment of what is considered a moderate and strong level of environmental values can be done. Taking this into account, we can now proceed to discuss the different levels of environmental values found in students at UNBC.

The literature review showed how, out of the general value model of Schwartz, the values that lead to Ecocentric environmental values were those of Universalism and Benevolence (the Self-Transcendence values). Out of these two, the one with the strongest relation with

Ecocentrism and pro-environmental behaviour was Universalism. Universalism values represent an ethic of care that extends to people beyond our close circle of relationships, to nature and to animal species. This study showed that there was a considerable measure of endorsement of Universalism values in all academic programs. Biology, Environmental Studies, Environmental Engineering, and Health Sciences all had scores above 5[3]. The mean score for Commerce students, which was statistically significantly different from the scores of students in other programs, was 4.37. Therefore, even Commerce students, who had the lowest score in this value, showed a moderate level of endorsement of Universalism values. A score of 4.37 is being considered of moderate importance by comparing it to the neutral score of this scale, which would be 3.5. The students in other programs, and especially Environmental Studies students, who gave this value a score of 5.95, are showing high levels of endorsement of Universalism values.

Environmental values were divided in this study into two categories, Ecocentrism and Anthropocentrism. While Anthropocentrism emphasized the worth of nature for the utilitarian value it has for humanity, Ecocentrism attributes worth to nature because of nature's own intrinsic value. The literature review showed that people with strong Ecocentric environmental values are more likely to behave pro-environmentally than those who have strong Anthropocentric values. Also, the literature, as well as this study, showed that there is a negative relation between Ecocentrism and Anthropocentrism. Considering that this value was rated on a scale from (1) Strongly disagree, to (3) Neutral, to (5) Strongly agree, we can see that there is a high level of endorsement of Ecocentric environmental values in all the academic programs studied at UNBC. Once again, Commerce students showed the lowest

[3] Universalism was measured on a Likert type scale ranging from (-1) Opposed to, (0) Not important, to (7) Extreme Importance.

ecocentric values, with a score of 3.58. This response lies right between (3) being neutral to the value, and (4) agreeing with it. Therefore, even if it is not a strong level of Ecocentrism, it is still on the positive side of the scale, and it was also higher than the Anthropocentrism score (3.16). All other programs showed scores above 4, with the exception of Health Science students, who had a score of 3.91, but which was not statistically significantly different from the score of Biology or Environmental Engineering students. Students from all programs showed higher values in Ecocentrism than in Anthropocentrism, even though Commerce students showed scores on both values which were very close to each other.

Beliefs in Growth and Technology were not supported by UNBC students. The scores ranged between 3 (Neutral) to 4 (Agree). A high score meant weaker beliefs in economic growth and technological solutions. Therefore, we find that Commerce students, who ranked lowest in this scale with a score of 3.07, had a neutral attitude to these beliefs. This means that they were in a middle ground between technology and behavioural solutions, and between economic growth and the environment. Students in every other program ranked above 3, meaning that they had a lower level of endorsement for these values. It also means that they usually prefer to preserve the environment rather than expand economic development, and that they would rather explore behavioural changes to solve environmental problems rather than only rely on technological solutions.

The literature review showed that the value of Power had a negative relation to pro-environmental behaviour, environmental attitudes and to Ecocentric environmental values, while having a positive relation to Anthropocentric environmental values. Students at UNBC showed low levels of endorsement of this value, as it was the weakest value for all programs, except for Commerce students, who ranked it 9 out of 10 and very close to the last ranking

value, Tradition. Nevertheless, Commerce and Health Science students stated that Power values were of importance to them, with scores above 3.5. Looking only at the value Wealth (one of the values in the Power category), the results showed that Commerce students had a score of 4.3 and Health Science students a score of 4.35. For Commerce students, wealth is as important as Universalism values. Even if Health Science students rated Power and Wealth relatively high, they still rated Universalism as being more important.

The study showed a surprising result. Hedonism values were ranked as the most strongly endorsed value at UNBC. The fact that Hedonism is ranked so highly can have implications for the environmental behaviour of students. This value emphasizes "Pleasure" and "Enjoyment of Life", and according to Schwartz it has egoistic motivations, and that is why it is placed right besides Achievement (a Self-Enhancement/Egoistic value) in the circular portrayal of human value categories (Schwartz, 1992). This finding is completely different from Schwartz & Bardi (2001). These authors state that humans are social creatures and for that reason Benevolence and Universalism are the group of main importance, since they guide our views of others. On a second order come the values of Security and Conformity across cultures, because, according to these authors, harmonious relations among group members depend on avoiding conflict and violations of group norms. Only on a third category of importance come the values of Hedonism and Stimulation, which are needed for independence, motivation and innovation. Schwartz & Bardi describe Hedonism and Stimulation as "social transformations of the needs of the individual, as a biological organism, for physical gratification and optimal arousal" (Schwartz & Bardi, 2001, p.282). The problem of these values at a society level is that they focus too much on the interests of the individual over that of the group. This value orientation might detract from collective

efforts that require individual constraints for the betterment of society and nature as a whole. Therefore, even if there is little evidence of the implications of this value on environmental behaviour, the strong focus on individual pleasure and gratification does ring alarm bells when thinking about the potential implications it might have on pro-environmental behaviour.

The results showed that UNBC students have a high level of endorsement of environmental values, and even the program that shows the lowest level, Commerce, still demonstrate positive environmental values. Health Science students, even if they give some measure of importance to Power and Wealth values, have high environmental values nonetheless. These results give evidence about the complex value system of this group of students. This will be further discussed in subsequent sections of this chapter.

5.3. Do students in different academic programs differ in their values?

The study showed significant differences in the values of students majoring in different academic programs at UNBC. There was a high endorsement of Universalism and Ecocentrism values by students in the programs of Biology, Environmental Engineering, Health Sciences and Environmental Studies. Environmental Studies students' Universalism and Ecocentrism values were significantly higher than those of students in every other program. Meanwhile, there was no difference in either of these values between the programs of Biology, Environmental Engineering and Health Sciences. Only Commerce showed significantly lower levels in Ecocentrism and Universalism.

Power and Anthropocentrism were the values that showed a negative relation to pro-environmental behaviour in the literature review. Based on the scores obtained from students in different academic programs for these two values, two groups were identified. Biology, Environmental Studies, and Environmental Engineering showed similar levels for the values of Power and Anthropocentrism which were slightly below the neutrality level, indicating slight levels of disagreement with these values. No statistical difference was found for these two values between Health Science and Commerce students; the scores for Power and Anthropocentrism for students in these two programs were slightly above the neutrality level, indicating moderate levels of agreement with these values.

The combination of the results of environmentally oriented values (Universalism and Ecocentrism) and the egoistic/utilitarian values (Power and Achievement) show that three different groups of students exist within the programs studied. The first group is made up by those students with high level of environmental values and low levels of egoistic values (Environmental Studies, Biology, Environmental Engineering). The second one is Commerce students, who have levels of environmental values bordering on neutrality and slight levels of agreement with Power and Anthropocentrism. The third group is Health Science students, which is at the same time the most enigmatic case. These students scored high in environmental values and yet still had moderate levels of agreement with Power and Anthropocentrism values. All these results potentially mean that one can expect higher levels of environmentalism in Environmental Studies, Environmental Engineering and Biology students. This result was expected. Commerce students have almost as high levels of Anthropocentrism and Power as of Ecocentrism and Universalism, with a considerable high endorsement of Wealth values. The score of Commerce students in the NEP Growth and

Technology scale indicates that they are neutral between economic growth and environmental protection as well as in between behavioural and technological solutions. Therefore one can expect the environmental behaviour of Commerce students to be more subject to particular situations than that of students in Environmental Studies, Environmental Engineering or Biology. It also means that economic opportunities are as important as environmental protection to Commerce students. Given this, we can expect less sacrifices being made by them to avoid or remediate environmental degradation when something of economic value becomes a trade-off against the pro-environmental behaviour.

The case of Health Science students is complex because they show a high level of endorsement for all values. Universalism ranks, amongst the general human values described by Schwartz, seven out of ten in importance. Regardless of this, the score of Universalism for Health Science students is not statistically significantly different than the score of Environmental Engineering and Biology students for this value. Also, Health Science students showed a score for the value Wealth that was slightly higher even than that of Commerce students. This endorsement of materialistic values by students who have such high Benevolence, Universalism, and Ecocentrism values is puzzling, and its implications for the environmental behaviour of this group of students is hard to predict. More studies of a qualitative nature need to be done in order to better assess the implications of these complex value systems on the environmental behaviour of Health Science students.

5.4. Does university contribute to the differences we see in the values of students from different academic programs?

As previously discussed, there are significant differences between the values of students in different academic programs at UNBC. But does the university experience contribute to this difference? The study shows that there were no significant differences between the values of first and fourth year students for any of the academic programs studied. By itself, this means that the university did not contribute to the differences found between programs. The differences were as big for the first year student samples as they were for the fourth year ones.

A second test was done in which fourth year students had to reflect on their Universalism and Power values and how these changed throughout the time spent at university. The result of this test only used descriptive statistics and therefore it does not hold a strong statistical power. Yet, the descriptive statistics presented do tell a story that gives hints on potential implications of education over the values of Power and Universalism. One of the most resounding results of this test was the large number of Biology students who mentioned that protecting the environment became more important to them throughout the time spent at university (93.55% of Biology students). Biology students showed an even larger percentage than Environmental Studies students, of whom 75% reported an increase in the importance attributed to protecting the environment. There was a very low level of Commerce students for which the university had a positive impact on the value of environmental protection (38.46%). No Biology student stated that protecting the environment became less important. At the same time, only 7.69% of Commerce students believed that this value lost importance through the years spent in University. The fact that there were more students who felt that

this value became stronger than students who believed that it became weaker is surprising. Due to the strong economic and business oriented rationale of this program, the hypothesis was that Commerce students would have experienced a decrease in the importance of this value, potentially seeing it as a trade-off against economic opportunities. It was a pleasant surprise to find that only 7.69% of Commerce students felt that protecting the environment became less important throughout the university years. Also, even though Health Science students attributed quite a moderate level of importance to Power, Wealth and Anthropocentrism values, not a single fourth year student in this program felt that protecting the environment lost importance in the four years spent at university. Therefore, even if there were no differences between first and fourth year student's values, students in fourth perceive their values to be changed.

There was a third test for which results were enlightening. Students had been asked to name the five values which were fostered the most by their academic program of study (out of the 37 value items from the shortened version of Schwartz value instrument). The results showed that the Biology and Environmental Studies programs fostered, above all else, Universalism values. Environmental Engineering also fostered Universalism values more than any other, but to a lesser extent than Biology or Environmental Studies. Students in Commerce believed that their academic program fostered Achievement values above all other, and in second place came Power values (both Achievement and Power are Self-enhancement/egoistic values, which showed negative relations to pro-environmental behaviour in the literature). Health Science, was once again the most enigmatic program, having no single value category gaining importance over others. Students in Health Science believed that their academic program fostered values across the whole value spectrum. Nevertheless, not a single Health

Science students mentioned that protecting the environment was a value fostered by their academic program of study. Even though these results show that students believe that some academic programs foster Universalism values more than any other value type, there is no evidence that these values actually transfer to the students.

Besides the large number of fourth year students in Biology and Environmental Studies that mentioned that Protecting the Environment became more important to them in the years they spent at university, there is no conclusive evidence that university has an impact in the environmental values of its students. The lack of statistically significant differences between the values of first and fourth year students supports this statement.

Due to the lack of studies that measure the change in environmental values of students throughout the four years that students spend at university, it is hard to make comparisons with other results. The literature does show some educational interventions, like first year environmental studies courses, that had positive impacts on the environmental values of students (McMillan, Wright & Beazley, 2004), and other studies showing the differences in environmental values between academic programs (Hodkinson & Innes, 2001). Yet, little is known of the effect that spending four years in university has on the environmental values of students. Chawla (1998) suggested that people who become strong supporters of the environmental movement throughout the late teenage years and early adulthood have been inspired by professors or friends, but the role of the university as a whole is not significant in this study. My study supports the findings of Hodkinson & Innes (2001) that suggested that academic programs with a strong economic rationale show a lower level of endorsement for environmental values. But the answer to the main question of whether university has an impact or not over the environmental values of students cannot be fully answered. All that

can be concluded at this point is that since no statistically significant differences were found between the environmental values of first year and fourth year students, we cannot state that university has an impact on these values. This result makes sense if we take into account that the literature tells us that higher education is undergoing the firsts steps of a deep transformation to integrate sustainability across its curriculum, regardless of program or year of study, and that a considerable amount of work and time are ahead of us until this transformation is complete. Maybe the environmental values of students will be positively affected once this transformation is over. For now, this study does not support the hypothesis that some programs have an impact on the environmental values of students.

5.5. Limitations of the study

The quantitative approach I took to my study enabled me to assess a complete spectrum of human values, environmental concerns, and beliefs about economic growth and technological advancement. By collecting quantitative data, I developed a more uniform dataset than if I had taken a qualitative approach, which at the same time allowed me to assess the whole system of human values of each respondent while capturing a considerably large sample (above 400 responses). However, informal discussions with students allowed me to see some of the limitations of applying only a quantitative approach to social research. These discussions usually occurred after students had filled out my survey and approached me with the intention of learning more about my research. After a few conversations I realized that the meanings given by students in different programs to values such as social power, authority, success and tradition varied considerably. The meanings of social power, authority, and success did not always have the egoistic/self-enhancement characteristics described by Schwartz (1992). Also, the meaning of the value category of tradition did not always

followed the western conservative approach assumed by Schwartz (1992). It was interesting to find, however, that people in similar career paths held somewhat similar beliefs in terms of what these words or phrases meant.

The concept of success in particular seemed to vary between individuals. Many Commerce students defined success as being something achieved through economic wealth, by being happy, or by gaining considerable social power and status. While most Environmental Studies students also mentioned happiness in their definition of success, many articulated that they would consider themselves successful if their careers had a positive impact on the world.

I also found that variables such as social power, which are within the Power value category (Schwartz, 1992) and are considered an egoistic/self-enhancement value, should not always be associated with poor environmental values, attitudes or behaviours. For example, I spoke with many Environmental Studies students who seemed to lead pro-environmental lives (amongst other behaviours, they mentioned biking to school, buying organic and local products, recycling and composting). These students felt that attaining positions of power was essential to implementing positive, large-scale environmental changes. These examples suggest how people with different backgrounds (or in this case, career paths) can give different meanings to the same values.

Speaking to students about their values led me to believe that some of the relations between value categories and environmentalism might not be as straight-forward or as simple as they are proposed by other authors. An extension of my thesis could involve a qualitative component to help understand how people with different career paths or backgrounds perceive the meaning of different values, in particular to understand the meaning of success,

social power, authority, happiness, and tradition. In addition, it would be interesting to correlate how people define the aforementioned values with their environmental behaviours. For example, when people define happiness or success, do they emphasize economic wealth and status, or do they emphasize less materialistic aspects of life such as leisure time, time spent with family, community vitality, love, health, or time spent in nature? In terms of social power, do people define it as the capacity to influence other people or do they take a less egoistic view where social power relates to the capacity to make decisions for the greater good of society and the ecosystems around us? Tradition can be assessed in a similar way. Tradition can be viewed as economic or religious traditionalism, associated with a conservative political ideology, or, as many students at UNBC viewed it, it can be related to First Nations culture and traditional ecological knowledge. The latter perception of tradition is more associated with ecological views of the world, meaning that it may be important to see how people with different career paths define each of these variables. I believe that this suggested continuation of my thesis may give further insight into the implications of career paths on environmentalism.

The second limitation of this study was that I did not utilize the full value instrument proposed by Schwartz (1992). I instead employed a shortened version developed by Schultz and Zelezny (1999) in order to keep the length of my survey down. The shortened version appeared to be a valid option for my research, as it showed significant results for a very large sample composed of populations from 14 different countries (Schultz and Zelezny, 1999). I conducted a pilot study using the shortened version, found statistical reliability in the scales, and concluded that it would be a valid instrument for my study. The limitation of having used this scale, however, was that it became difficult to make comparisons between my results and

those of Schwartz and Bardi (2001). The comparison found discrepancies between my results and those of Schwartz and Bardi's (2001) and the possibility exists that these differences could be attributed to the differences between the scales.

Even though my overall sample size was large ($n > 400$), the number of students in some of the academic programs relevant to this study was small. This was particularly true in the fourth year groups. These small sample sizes could have led to the statistical analysis not finding differences between the values of first and fourth year students. Repeating this study in a larger university or across several universities could help attain a larger sample size and could eliminate potential type one errors, therefore increasing the likelihood of finding statistically significant differences amongst first and fourth year samples of students. I still would like to remark, however, that several programs had sample sizes above 28 on both the first and fourth year samples (Commerce and Biology), and yet no statistically significant differences were found in the comparison of the values within each program. Also, it is important to remember that the effect sizes based on year and based on the intersection between year and program were only small, meaning that regardless of the size of sample and statistical significance, the differences were small.

One last issue that needs to be addressed in this section is that the comparison between the values of students in first and fourth year for each degree utilized independent samples. The optimal situation would have been to assess the values of students at the start of their academic programs, and then reassess after they had completed all the requirements of their degrees. Unfortunately, due to time constraints, I was forced to compare separate groups of first and fourth year students and assume that the two samples were similar. The limitation in this is in my ability to state whether a particular group or sample (e.g. fourth year Biology

students) has changed or not due to the university experience. In order to reduce this barrier, fourth year students were asked to reflect on the change they experienced over the four years they spent at university in the values of Universalism and Power.

Regardless of these limitations, the study assessed a very broad amount of data and took into account many variables. Many of the results found are of significant importance to environmental education at the university level. The conclusion chapter will expand on the significance of these findings and a few recommendations will be made which could positively contribute to the improvement of environmental education at the university level with the purpose of enhancing environmentalism and environmental values in university students.

Chapter Six

Conclusion and Recommendations

6.1 Conclusions and recommendations

This research tried to make an honest depiction of the environmental values of students in different academic programs at UNBC. The main question that this study wanted to answer was whether there were significant changes in the environmental values of students in the four years that students spent at university. To accomplish this, three sub-questions were asked and answered:

1. On average, do students at UNBC show a concern about the environment?
2. Do students in different programs differ in their values?
3. Does university contribute to the difference that we see in the environmental values of students from different academic programs?

This research showed that students at UNBC have a high level of concern for the environment. Both Universalism values (care for others who are not particularly close to the individual, and an ethic of care towards nature) and Ecocentrism values (valuing nature not because of its worth to humankind, but for its own intrinsic value) were high for students in all academic programs studied except for Commerce students, who had a very small level of endorsement of environmental values. Nevertheless, they showed positive feelings towards these values, which is a more positive result than what might have been expected from a program so focused on economic opportunities and development.

Commerce and Health Science students showed a slight positive endorsement of the values which tend to act as a barrier to pro-environmental behaviour. These values are Power (control over others and resources, status, etc.) and Anthropocentrism (a utilitarian view of nature and the environment, where nature's worth is based on the benefits it provides to

humankind). Amongst the values that make the Power category, special attention was placed on the strength of the Wealth value; both Commerce and Health Science students showed an even more positive endorsement of this value than they did towards the rest of the values that make up the Power category. This shows that students in both these programs have materialistic tendencies. The literature showed that people with materialistic values tend to perceive environmental protection as a trade-off for material wealth, therefore the positive endorsement of these values can hinder pro-environmental behaviour.

There were significant differences between the values of students in different academic programs. Environmental Studies students showed the strongest environmental values (Universalism and Ecocentrism), Biology, Environmental Engineering and Health Sciences students all demonstrated similar, high levels of environmentalism, while Commerce students showed the lowest. As far as Egoistic/Utilitarian values are concerned, there were two groups: one which demonstrated negative feelings towards these values (Environmental Studies, Biology, Environmental Engineering) and another group which slightly endorsed them (Commerce and Health Sciences students).

The comparison between the values of first and fourth year students did not show any significant differences between them. Therefore, this research cannot state that university had an impact on the differences found between the values of students in different academic programs. The fact that fourth year students in all programs reported positive changes in the Universalism values is not enough evidence to state that university had an impact on the values. This research asked fourth year students to report which values they believed had been fostered the most by their academic program of study, as well as to state whether they believed that their Universalism and Power values became stronger, did not change, or

became weaker in the four years they spent at university. These two tests were meant to provide additional data in case differences were found between first and fourth year students, so that we could better understand the nature of the differences. No significant differences were found between the values of first and fourth year students, the self reported change in values of fourth year students and their beliefs of which values were fostered the most by their academic program of study are, on their own, not enough evidence to state that university had a significant impact on the environmental values of students. Nevertheless, these two tests are suggestive that there might be more than what the numbers and statistics show, and additional studies, of a more qualitative nature, are recommended to get deeper into the issue of whether changes occur in the environmental values of students at university.

Two conclusions come out of the obtained results; either university has no impact on the environmental values of students, or the programs that actually make an effort to improve environmental values are educating students who already possess these values. It could be possible that students self-select academic programs that align with their value systems, therefore no change would be found in the values of students in programs such as Environmental Studies or Biology. This would suggest that work needs to be done in those programs where environmental values are low, such as Commerce. As the literature suggest, more environmental and sustainability content should be included throughout the whole curriculum of the Commerce program (as well as in other programs with a low endorsement of environmentalism), rather than having a course or two on sustainability that appears alien to students in that program.

There is still a lot of work to be done to better understand the impact of university on environmental values. Also, considerable work needs to be done to include sustainability

across the curriculum of all programs, and especially those programs whose students express a low level of agreement with environmental values. One piece of good news that comes out of this study is that at least environmental values have not lost importance to students in any academic program studied. Even Commerce, whose students believed that it fostered egoistic values above all others, did not have a negative impact on the values of students.

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Appendix 1

Survey

Program of studies: Gender:

Year of study in your program: Age:

Rural or urban upbringing? (Mark with an X besides the right answer)

Rural _____ Urban _____

Section 1: Mark with a cross on the five-point Scale the option that better represents your reactions to the following statements (from 1 Strongly Disagree, to 5 Strongly Agree):

	1.Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
1) Science and technology often do as much harm as good					
2) One of the worst things about overpopulation is that many natural areas are getting destroyed for development					
3) The worst thing about the loss of the rain forest is that it will restrict the development of new medicines					
4) When humans interfere with nature, it often produces disastrous consequences					
5) I can enjoy spending time in natural settings just for the sake of being out in nature					
6) The best thing about camping is that it is a cheap vacation					
7) More emphasis should be placed on teaching children about nature than on teaching them about science and technology					
8) Sometimes it makes me sad to see forests cleared for agriculture					
9) It bothers me that humans are running out of their supply of oil					
10) We cannot keep counting on science and technology to solve our problems					
11) I prefer wildlife reserves to zoos					
12) Science and technology will eventually solve our problems with pollution, overpopulation, and diminishing resources					
13) Humans must live in harmony with nature in order to survive					
14) One of the most important reasons to conserve is to ensure a continued high standard of living					
15) It makes me sad to see natural environments destroyed					
16) The thing that concerns me the most about deforestation is that there will not be enough lumber for future generations					
17) Rapid economic growth often produces more problems than benefits					
18) Nature is valuable for its own sake					
19) One of the most important reasons to keep lakes and rivers clean is so that people have a place to enjoy water sports					

Continues on the next page...

	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
20) Humans are severely abusing the environment					
21) Sometimes when I am unhappy I find comfort in nature					
22) The most important reason for conservation is human survival					
23) Canadian citizens are going to have to reduce their consumption of material goods over the next few years					
24) Sometimes animals seem almost human to me					
25) One of the best things about recycling is that it saves money					
26) In general, Canadian citizens would be better off if the nation's economy stopped growing					
27) Being out in nature is a great stress reducer for me					
28) Nature is important because of what it can contribute to the pleasure and welfare of humans					
29) The positive benefits of economic growth far outweigh any consequences					
30) One of the most important reasons to conserve is to preserve wild areas					
31) Continued land development is a good idea as long as a high quality of life can be preserved					
32) Most problems can be solved by applying more and better technology					
33) Humans are as much a part of the ecosystem as other animals					
34) We need to preserve resources to maintain a high quality of life					
35) I need time in nature to be happy					

Continue to section 2 on the following page...

Section 2: On the following items, mark with a cross the choice that more accurately answers HOW IMPORTANT are the following values as guiding principles in your life. The scale ranges from -1 (opposed) to 0 (not important), to 7 (extremely important)

	-1. Opposed To	0. Not Important	1	2	3	4	5	6	7 Extreme Importance
1) Protecting the Environment									
2) Being helpful									
3) Social Power									
4) Successful									
5) Creativity									
6) Daring									
7) Pleasure									
8) Being devout									
9) Politeness									
10) Clean									
11) A world of beauty									
12) Honesty									
13) Authority									
14) Capable									
15) Curious									
16) Enjoyment of life									
17) A varied life									
18) Respect for tradition									
19) Honoring parents and elders									
20) National security									
21) Unity with Nature									
22) Loyalty									
23) Wealth									
24) Ambition & being ambitious									
25) Freedom									
26) An exciting life									
27) Humility									
28) Obedience									
29) Social order									
30) Being broad-minded									
31) Being forgiving									
32) Preserving public image									
33) Influential									
34) Choosing your own goals									
35) Moderate									
36) Self-discipline									
37) Familiy security									

Section 3: Answer the following questions about climate change. After each question write a number between 0 and 1 (example, 0.66). Your answer will state the level of agreement between two extremes.

1) Timing of global warming: 0 (Not yet begun to happen) to 1 (already begun to happen)

_____

2) Primary cause of global warming: 0 (natural changes in the environment) to 1 (effects of pollution from human activities)

_____

3) Scientific consensus on global warming: 0 (most scientists believe global warming is not occurring or most scientists are unsure) to 1 (most scientists believe global warming is occurring)

_____

4) I worry about global warming: 0 (not at all) to 1 (a great deal)

_____

5) I perceive the threat from global warming as: 0 (will NOT pose a serious threat to you and your way of life in your lifetime) to 1 (will post a serious threat to you and your way of life in your lifetime)

_____

6) Seriousness of global warming: 0 (seriousness of global warming is generally *exaggerated* in the news) to 1 (seriousness of global warming is generally *underestimated* in the news)

_____

Section 4: Answer this section only if you are a **4th year** student.

- Look back to the day before you started university. Think about what your values were like then. Do you think any of the following values have changed in the past four years. For each of the values listed below, mark with an X stating whether you believe each value became stronger, weaker or did not change between then and now.

	1. Became Stronger	2. Did not change	3. Became weaker
1) Social Power			
2) Protecting the environment			
3) Devout			
4) Authority			
5) A world of beauty			
6) Respect for tradition			
7) Wealth			
8) Unity with nature			
9) Moderate			
10) Preserving my public image			
11) Broad minded			
12) Humble			

- Answer this question only if you are a 4th year student. Of the values listed in section 2, write down the five values which you think were fostered the most by your program of studies.

_____

_____

_____

_____

_____

Appendix 2

Letter of consent for participants

Letter of Consent for research on student's attitudes, values and behaviors

Dear Respondent,

I am inviting you to participate in a research project to study the attitudes, values and behaviors of students at UNBC. Attached to this letter is a questionnaire that asks a variety of questions about the previously mentioned topics. I am asking you to look over the questionnaire and, if you choose to do so, complete it and deposit it in the box provided. It should take you between 10 and 15 minutes to complete. You were chosen to participate in this research as you are a student enrolled in one of the degrees I am studying.

The completion of this questionnaire is voluntary, and you have the right to withdraw from completing the questionnaire at any time. I will be the only person who will see the responses to the questionnaire. I do not know of any risks to you if you decide to participate in this study and I guarantee that your responses will not be identified with you personally in any ways. Do not write down your name nor anything else which could identify you. The information will be stored in my office and will be accessed only by myself. This information will be kept until the results are analyzed and I defend my thesis. Once the thesis is defended, this information will be destroyed. If you have any questions on this research you can contact me at my cell phone (250) 552-6947 or by e-mail to palazue@unbc.ca, and I will gladly answer any questions you have on this topic. If you would like a copy of the results of this research, please send me an e-mail and I will send the results back to you as soon as they are available. If you have any concerns regarding this research please contact my supervisor, Dr. Annie Booth (annie@unbc.ca) or the UNBC Office of Research (reb@unbc.ca or 250.960.5650).

In order to assure your anonymity, you are not required to sign this letter of consent, you must know that the completion of this questionnaire indicates understanding of and compliance with the terms stated in this letter.

Thank you very much,

Alvaro Palazuelos.